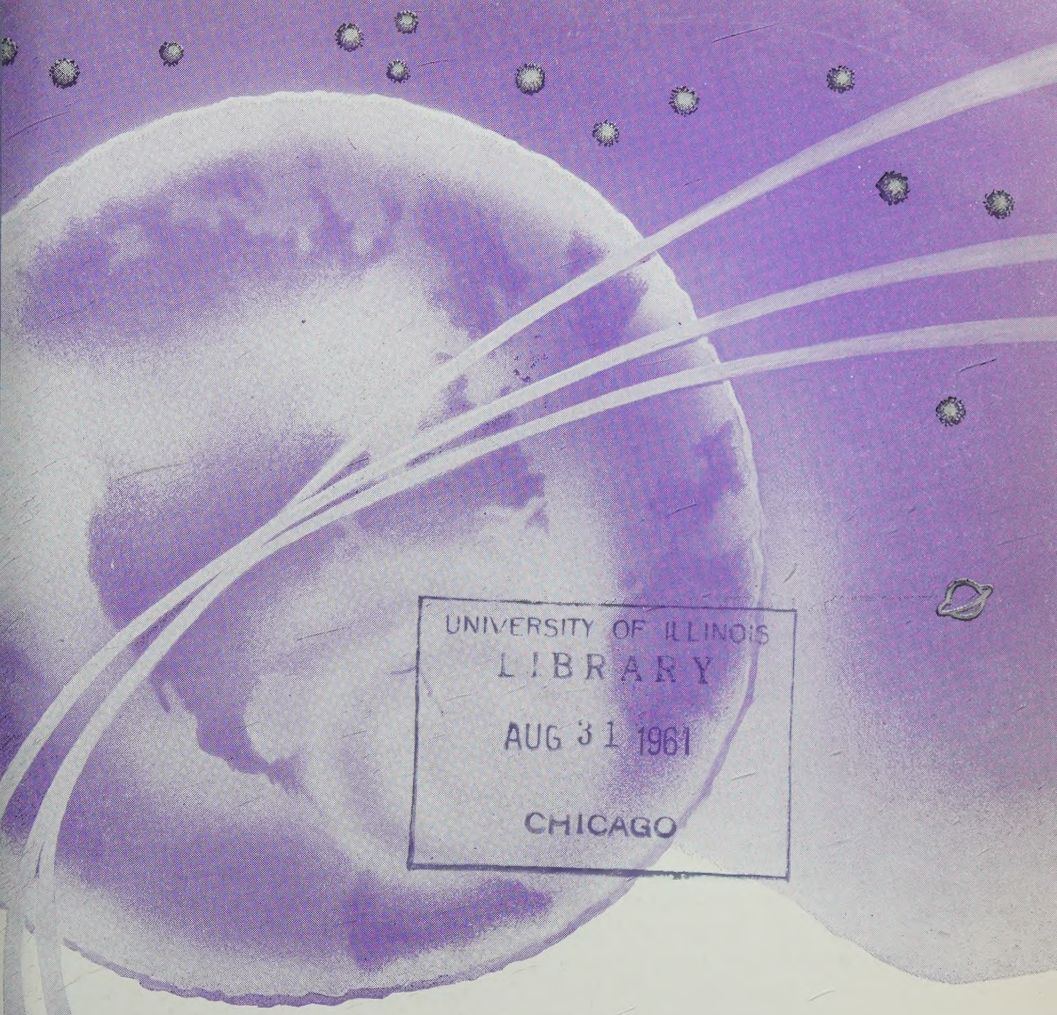
AMERICAN METEOROLOGICAL SOCIETY



UNIVERSITY OF ILLINOIS
LIBRARY
AUG 31 1961
CHICAGO

Meteorological & Geoastrophysical ABSTRACTS

Vol. 12 APRIL 1961 No. 4

METEOROLOGICAL AND GEOASTROPHYSICAL ABSTRACTS

***Editor and Supervisor:* MALCOLM RIGBY (Washington)
#Business Manager: KENNETH C. SPENGLER (Boston)
Corresponding Editor: *ANDRE VANDENPLAS (Uccle, Belgium)
Corresponding Analyst: *I. L. DORDICK (Chicago, Ill.)
Corresponding Analyst: *RONALD BAKER (Harrow, Eng.)

EDITORIAL STAFF (Washington)

Assistant Editor (Publications): MARY L. RICE
Chief Bibliographer (Accessions): GEZA THURONYI
Chief Cataloger: DOROTHY M. GROPP
Chief Indexer: *MARINA SZE
Technical Editor: HAFEEZ MALIK

Bibliography

ELEMER KISS
ANDREW J. MEGLIS
OTTO TABORSKY

Abstracting

EVELYN Z. SINHA
KIWON CHUNG
AJMAL H. KHAN
NNDEM E. U. NNDEM
WILHELM NUPEN
ISMAIL SAAD
*NICHOLAS P. SETCHKIN

Cataloging

*BEVERLY HUGHES
*BARBARA H. KING
*MARGARET MATTHEWS
*SHIRLEY PANARA
*LAURA I. PETERSON

Indexing

*MURIEL F. HAAS
*WINIFRED SCHRAITLE
*MARY B. DENNY
*SUSAN MANOVILL
*HELEN THURONYI
*RUSSELL G. CADY

Processing

*EDITH N. HAUPT
*DORIS G. NICKEY
*MILDRED CARROLL
*HELEN I. RICKELS
*RUTH S. GARVEY

* Part time.

****EDITORIAL OFFICE:** Washington, D. C. **P.O. ADDRESS:** Box 1736, Washington 13, D. C. Telephone: REpublic 7–6278.

#ADMINISTRATIVE OFFICE: American Meteorological Society, Office of Executive Secretary, 45 Beacon Street, Boston 8, Mass.

Address all business communications, orders and inquiries to the Executive Secretary, Mr. Kenneth C. Spengler, 45 Beacon Street, Boston 8, Mass. Exchanges and reprints may be sent direct to P. O. Box 1736, Washington 13, D. C.

METEOROLOGICAL AND GEOASTROPHYSICAL ABSTRACTS is a monthly publication devoted to:

A. Current Abstracts in English on important meteorological and geoastrophysical literature in every language.

B. Bibliographic references to other items of interest to the profession.

C. Selective, annotated bibliographies on subjects of immediate and special interest to meteorologists, geophysicists and astrophysicists.

SUBSCRIPTION RATE: $60 ($15.00 per year to members). Prices for single copies $10 ($5 to members); back issues $6 ($3 to members); back volumes $30 ($15 to members); Vol. 1–10 complete, $200 $100 to members).

METEOROLOGICAL AND GEOASTROPHYSICAL ABSTRACTS

MALCOLM RIGBY, Editor

Vol. 12 April 1961 No. 4

AGRICULTURE · COMMERCE · AERIAL AND MARINE NAVIGATION · PUBLIC HEALTH · INDUSTRY · ENGINEERING
AMERICAN METEOROLOGICAL SOCIETY
1919

Supported by
DEPARTMENT OF THE AIR FORCE
DEPARTMENT OF THE ARMY
DEPARTMENT OF THE NAVY
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
NATIONAL SCIENCE FOUNDATION
UNITED STATES WEATHER BUREAU

Special Feature in This Issue

Annotated Bibliography on Upper Atmosphere Structure
(General and 30-80 km)

By

Elemer Kiss

(*For complete table of contents see back cover*)

Published monthly at Prince and Lemon Streets, Lancaster, Pa., by the AMERICAN METEOROLOGICAL SOCIETY, 45 Beacon Street, Boston 8, Mass.

Printed and issued by: Lancaster Press, Inc.

FOREWORD

Meteorological and Geoastrophysical Abstracts is a monthly publication devoted to current literature in meteorology, geophysics and astrophysics.

Part I contains abstracts of current literature in the fields of meteorology, etc.

Part II of each issue comprises an annotated bibliography of important references on a special subject. Bibliographies published in the successive issues were:

Vol. I, 1950

1. Atmos. Pollution	2. Aerobiology	3. Cloud Physics	4. Hail
5. Tornadoes	6. Volcanic Dust	7. Climat. Changes	8. Thunderstorms
9. Icing	10. Acoust. Propagation	11. Evaporation	

Vol. II, 1951

1. Extended Forecast.	2. Long Range Forecast.	3. Soil Temp.	4. Constants, etc.
5. Clim. of Near East	6. Clim. of Middle East	7. Special Winds	8. Radar Storm
9. Condensation Trails	10. Clim. of N. E. Africa	11. Mountain Met.	Detect.

Vol. III, 1952

1. Clim. of N. W. Africa	2. Carbon Dioxide	3. Clim. of Argentina, etc.	4. Dew
5. Objective Forecast.	6. Stratus Forecast.	7. Urban Climatology	8. Clim. of C. Africa
9. Visibility	10. Glaze and Rime	11. Free Air Turbulence	

Vol. IV, 1953

1. Turbulence Theory	2. Turbulent Diffusion	3. Frost	4. Clim. of Australia, etc.
5. High Level Winds	6. Winds in Stratosphere	7. Jet Stream	8. Radiation Bioclim.
9. Clim. of Pacific	10. Auroras	11. Sferics	

Vol. V. 1954

1. Oceanog. Met.	2. Clim. of S. E. Asia	3. Auroral Physics	4. Tropopause
5. Balloons	6. Numerical Forecast.	7. Radiation Data	8. Vertical Motion
9. Clim. of Arctic	10. Industrial Met.	11. Wind Waves and Swell	

Vol. VI, 1955

1. Bibliog. of Bibliog.	2. Texts & Monogr. Bibliogs.		3. Storm Surges
4. Ionospheric Prop.	5. Photochem.—Upper Atmos.		6. Cloud Physics
7. Radar Cloud Physics	8–9. Atmos. Nuclei	10. Weather Modification	11. Cooling Power

Vol. VII, 1956

1. Synoptic Met.-Arctic	2. Clim. of Enclosed Spaces	3. Cosmic Rays (–1952)
4. Cosmic Rays (1953–56)	5. Atmos. Radioactivity	6. Inversions
7. Snow Micromet.	8. Snow Micromet. (Suppl.)	9–11. Tropical Cyclones

Vol. VIII, 1957

1. Solar Weather Relations	2. Night Airglow	3. Forecasting Special Elements	
4. Forest Micrometeorology	5. Hydromet. Forecasting	6. Numerical Forecast. (Suppl.)	
7. Albedo	8. Meteors	9–10. Tropospheric Prop.	11. Medical Meteorology

Vol. IX, 1958

1. Radioastronomy	2. Solar Astrophysics	3. Radioactivity in Atmosphere	
4. Waves and Currents	5. Physical Oceanog.	6. Dynamic & Phys. Oceanog.	
7. Long Range Forecast.	8. Radar Met.	9. Cosmic Rays	10–11. Geomagnetism

Vol. X, 1959

1. Works of C. E. P. Brooks	2. Tornado Forecasting	3. Soil Moisture	4. Sferics
5–6. Ozone	7. Acoustic Waves	8. Evaporation Measurement	
9. Evapotranspiration (–1955)	10. Evapotranspiration (1956–1959)		11. Evaporation

Vol. XI, 1960

1. Outstanding Reference Works	2. Outstanding Texts	3. Numerical Forecast. (Suppl.)
4. Ionospheric Physics	5. Ionospheric Propagation	6. Ionosphere
7. Forecast Verification	8. Radar Meteorology	9. Rocket Meteorology
10. Satellite Meteorology	11. Airglow	

Bibliographies in preparation or published in Vol. XII

Aurora (No. 1)	*Limnology* (No. 3)	*Physics of Lightning*
Auroral Physics (No. 2)	*Upper Atmosphere Structure* (No. 4, 5 and 6)	*Precipitation Chemistry*

Part III contains a listing of reviews, translations, reprints, and the contents of important publications. These are published in the earliest issue where space permits.

Part IV is made up of author, subject and geographical indexes.

EXPLANATIONS

Location of material: For each entry, a symbol is given for at least one library where the material may be found. The Union List of Serials (Gregory) is the source of most of the symbols used. In some cases, where no symbol has been assigned to a library, one will be devised according to the principles of the Union List.

Library symbols used frequently may be found in the following list:

DA:	U. S. Dept. of Agriculture Library, Washington, D. C.
DBS:	U. S. Bureau of Standards Library, Washington, D. C.
DGS:	U. S. Geological Survey Library, Washington, D. C.
DLC:	Library of Congress, Washington, D. C.
DN-HO:	U. S. Navy Hydrographic Office Library, Suitland, Md.
DNLM:	U. S. National Library of Medicine, Washington, D. C.
DSI:	Smithsonian Institution, Washington, D. C.
DWB:	U. S. Weather Bureau Library, Washington, D. C.

Other symbols:

*	before an entry indicates a good data source.
†	before an entry indicates a good bibliography.
§	before an entry indicates a synoptic case history study accompanied by charts.
Ⓢ	after an abstract indicates an abstract prepared for NASA.

Geographic locations are in the English form rather than the form used locally, for example, Moscow for Moskva.

Titles of articles or monographs are in the language of the original article unless otherwise stated. Slavic (Cyrillic) titles are transliterated into the Roman alphabet using a modification of the Library of Congress transliteration scheme.

Abbreviations:

Titles of periodicals are not abbreviated, as a rule.

The months of the year from March to July are not abbreviated. Other months are abbreviated as Jan., Feb., Aug., Sept., Oct., Nov., and Dec.

The word or abbreviation for Volume (Tom, Band, Jahrgang, Año, etc.), for Number (Heft, Fascicule, Vypusk, etc.) and for page or pages is omitted from most entries. Thus an entry will read as follows:

Meteorologische Rundschau, 2(5/6):146–151, May/June 1950.

This indicates that the article appeared in *Meteorologische Rundschau*, *Jahrgang* 2 (Vol. 2), *Heft* 5/6 (No. 5/6), *pages* 146–151, May/June 1950.

PART I. ABSTRACTS OF CURRENT METEOROLOGICAL MATERIAL

A. GENERAL

A1. COLLECTED WORKS

12.4–1 551.510.53(08) 551.506.22

*†Ratcliffe, J. A. (*ed.*), **Physics of the upper atmosphere.** N. Y., Academic Press, 1960. 586 p. figs., tables, refs., eqs. Review by M. G. Morgan in *Institute of Radio Engineers, N. Y., Proceedings*, 48(12):2045, Dec. 1960. Review by E. V. Appleton in *Journal of Atmospheric and Terrestrial Physics*, London, 19(3/4):295, Dec. 1960. Contents: Chapman, Sydney, **The thermosphere: the earth's outermost atmosphere,** p. 1–16. Nicolet, Marcel, **The properties and constitution of the upper atmosphere,** p. 17–71. Newell, Homer E., Jr., **The upper atmosphere studied by rockets and satellites,** p. 73–132. Friedman, Herbert, **The sun's ionizing radiations,** p. 133–218. Bates, D. R., **The airglow,** p. 219–267. Bates, D. R., **General character of auroras,** p. 269–296. Bates, D. R., **The auroral spectrum and its interpretation,** p. 297–353. Booker, Henry G. **Radar studies of the aurora,** p. 355–375. Ratcliffe, J. A. and Weekes, K., **The ionosphere,** p. 377–470. Vestine, E. H., **The upper atmosphere and geomagnetism,** p. 471–512. Greenhow, J. S. and Lovell, A. C. B., **The upper atmosphere and meteors,** p. 513–549. [Chapman, Sydney, Newell, Homer E., Jr., et al.], **Advances during the International Geophysical Year, 1957/1958, by authors of various of preceding articles,** p. 551–563. These articles abstracted separately. **DWB** (M10.5 R233ph)—This excellently edited collection of articles, reviewing current knowledge of the atmosphere above 60 km, consists of the 12 above cited chapters written by well-known authorities on the physics and chemistry of the upper atmosphere. It includes knowledge of the aurora, airglow, ionosphere, meteors, and geomagnetism gained from direct and indirect methods—rockets and satellites, etc., mainly before IGY but with supplementary information obtained during 1957/58 and even 1959. Recent advances in knowledge of the Van Allen Belts, radar studies of the aurora and solar ionizing radiations are treated in the final chapter written by various authors on the results of IGY. The articles as a whole contain a great deal of theoretical as well as experimental results. An extensive author index, including references to authors referred to in the bibliographies, and a subject index are appended. *Subject Headings:* **1. Upper atmosphere physics 2. IGY advances in aeronomy.**—*M.R.*

12.4–2 551.507.362.2(08)

Institute of the Aeronautical Sciences, **Applications of manned stratospheric laboratories: minutes of Sessions held at the 27th Annual Meeting of the Institute, N. Y., Jan. 29, 1959.** Comp. and ed. by Vitro Labs., Silver Spring, Md. under Contract Nonr-2656(00) for the Office of Naval Research. [1959]. 174 p. 25 figs., tables, foot-refs. Contents: de Vaucouleurs, G. H., **Requirements for high resolution photography of planets,** p. 7–29. Blamont, Jacques, **Infra-red and ultra-violet measurements at high altitude,** p. 31–41. Ross, M. D., **Proposed observations of the Martian atmosphere,** p. 43–53. Roberts, W. O. and Newkirk, G. A., Jr., **Geophysical researches of stratospheric laboratory,** p. 55–70. Mantis, H. T., **Measurement of atmospheric dispersion and vertical motion,** p. 71–82. Vonnegut, B., **Observation of severe storms from above,** p. 83–86. Kittinger, J., **Training in preparation for Man High I,** p. 105–112. Yagoda, Herman, **Cosmic ray detection by visual scintillations,** p. 113–124. Beson, E. E., **Balloon-borne capsule as a space flight trainer,** p. 125–142. Gates, D. M., **Infrared spectroscopy from balloons and the possibility of some observations on the biosphere,** p. 143–148. Smith, J. R., **The strato-laboratory as a systems testing platform,** p. 149–158. (These articles abstracted separately) **DWB** (M(051) V847ap). *Subject Headings:* **1. Satellite observatories 2. Satellite observation.**

12.4–3 629.19

American Astronautical Society, **Proceedings of the 2nd Western National Meeting of the Society, Los Angeles, Calif., Aug. 4–5, 1959,** issued **1960.** 356 p. figs., tables, refs., eqs. (*Advances in the Astronautical Sciences*, N. Y., Plenum Press.) (For listing of contents, *see* Pt. III, p. 1374, Oct. 1960, *Met. Abs.* These articles abstracted separately.) **DWB** (629.1388 A512pro), **DLC**—The papers presented at the conference covered the following subjects: 1) Human factors. 2) Space mechanics, control and guidance. 3) Advanced propulsion and power. 4) Astronautical systems and space vehicle design. 5) Space communication and instrumentation and 6) Lunar and planetary environment. *Subject Heading:* **1. Astronautics.**

A2. BOOKS AND TEXTBOOKS

12.4–4 551.510.42:543

†Jacobs, Morris Boris (*Air Pollution Control consultant*), **Chemical analysis of air pollutants.** N. Y., Interscience Publishers, **1960.** 430 p. figs., tables, bibliog. at end of each ch. (*Chemical Analysis*, Vol. 10). **DWB** (M10.42 J17ch)—This book presents a systematic discussion of the subject of chemical analysis in air pollution control. Numerous methods of analysis are described. These include: 1) general methods for sampling as well as the procedures for the determination of air and gas volume, quantity and velocity; 2) methods for the analysis of settled particulate matter and for suspended particulate matter and 3) methods for the analysis of the gaseous and vapor contaminants of the atmosphere, including radiochemical methods. Of the 17 chapters some are also devoted to stack sampling and the determination of dust loading, to the determination of incinerators, to flue gases, to the estimation of motor vehicle exhaust gases, and to the determination of odor. Methods for the monitoring of air pollutants are also discussed. *Subject Headings:* **1. Atmospheric pollution 2. Chemical analysis of air pollutants.**—*I.S.*

12.4–5 551.557(02)

*†Pogosian, Khoren Petrovich, **Struĭnye techeniia v atmosfere.** [Jet streams in the atmosphere.] Moscow, Gidrometeoizdat, **1960.** 182 p. 74 figs., 41 tables, 121 refs. **DWB** (M57.2 P746stu)—The more technical publication with respect to data presented and the dynamic approach, of two monographs on the jet stream, issued by the Gidrometeoizdat in 1960 (Vorob'ev, 12.4–6). A wealth of original analyses of aerological data for Eurasia is presented in tables, cross sections and charts, based mainly on 1957–59 (IGY) data from subtropical latitudes (India) to the pole (SP-7). Mean circulation charts of the Northern Hemisphere are presented for 500, 300, 200, 100, 50, 30, and 15 mb levels and data are included for these levels for each 10° latitude from 80° to 10°N, and cross sections (1000–15 mb) along various longitudes from Europe to the Far East (showing effect of high mountain massives such as the Tibet-Himalaya ranges and plateau); temperature and wind fields to 15 mb character (classification and structure of jet streams, relation to tropopause and fronts, frequency, etc.); evolution (effect of advection, vertical motions, temperature changes, movement of cyclones and anticyclones, orography); temperature and winds to great heights (90–100 km) and, finally, a list of references (52 Russian and 69 non-Russian). *Subject Headings:* **1. Jet stream textbooks 2. Upper air data—100 km (15 mb) 3. IGY data analyses 4. Orographic effects on jet stream 5. Mean Northern Hemisphere charts (500–15 mb) 6. U.S.S.R.**—*M.R.*

12.4–6 551.513.2:551.557.7(02)

§†Vorob'ev, V. I., **Struĭnye techeniia v vysokikh i umerennykh shirotakh.** [Jet streams in the high and middle latitudes.] Leningrad, Gidrometeoizdat, **1960.** 233 p. 84 figs., 38 tables, 162 refs., eqs. **DWB** (M57.2 V954st)—This is the larger and more substantial of two new works on the jet stream published by the Gidrometizdat in 1960. The other (Kh. P. Pogosian 12.4–5) is a paper-back manual, or text, with a great deal of original data and cross sections through various parts of the U.S.S.R., intended for in-service use; whereas this textbook is intended for wider use in academic, as well as service training and practice. The approach of this book is mainly graphical—in an attempt to tie in the various macro-synoptic processes of the Northern Hemisphere with the jet stream, and to find its causes (for forecasting purposes) in the North Atlantic, Europe, Siberia or East Asia at different seasons. Analysis of high

level charts to show the jet stream areas, types (Vangengeim) of synoptic processes and the jet stream with westerly, easterly, meridional and varied or changing types of circulation and, finally, the distribution of meteorological elements (temperature, 500 mb topography, wind, tropopause, turbulent energy exchange) and forecasting jet stream. Finally, an example (March 22–April 3, 1953) is analyzed and a chapter devoted to flight in jet streams. The bibliography contains 71 Russian and 91 non-Russian references. *Subject Headings:* **1. Jet stream textbooks 2. General circulation types 3. U.S.S.R.**—*M.R.*

12.4–7 551.**574.1**:551.**507.352**(02)

†*Zaĭtsev, V. A. and Ledokhovich, A. A., **Pribory i metodika issledovaniia oblakov s samoleta.** [Instruments and investigation methods of clouds by airplanes.] Leningrad, Gidrometeoizdat, **1960.** 175 p. 83 figs., 21 tables, 99 refs., eqs. **DWB** (M01.776 Z21pr)—A highly specialized textbook giving instructions and principles for measuring physical properties of clouds by recording equipment installed in airplanes. The first chapter covers the measurement of temp., humidity and pressure by means of the aerometeorograph and compared with hygrothermograph readings Sm-43. Ch. 2 takes up the measurement of the air in and below or outside clouds; and the accuracy thereof, using thermometers and meteorographs. Ch. 3 does the same for humidity measurements in clouds. Ch. 4 discusses recording meteorological elements and the irregularities of temp. in and around clouds. Ch. 5 takes up measurement of the size of cloud particles (ice and water). Ch. 6 discusses the measurement of water content of clouds and fog; Ch. 7, the measurement of the optical characteristics of clouds (visibility, etc.); Ch. 8, various equipment used on airplanes to measure height, pressure and air speed and, finally, Ch. 9 the installation of equipment on planes and working up aerological data therefrom. A good bibliography, mostly to Russian literature, is appended. Equipment wiring diagrams, installations, calibration charts, errors, results of measurements, etc. are given in figures and tables, nomograms, etc. by way of illustration. Laboratory or wind tunnel measurements are compared with flight measurements in every chapter. *Subject Headings:* **1. Airplane cloud physics measurements 2. Air-borne instrumentation textbooks 3. Cloud physics measurement textbooks 4. Aerometeorography 5. U.S.S.R.**—*M.R.*

12.4–8 551.**515.83**(02) 551.**509.313**(02)

§†*Gubin, V. I., **K gidrodinamicheskoĭ teorii frontogeneza.** [Hydrodynamic theory on the origin of fronts.] Tashkent, Akademiia Nauk Uzbekskoĭ SSR, **1960.** 143 p. 29 figs., 58 refs., numerous eqs. At head of t-p.: Akademiia Nauk Uzbekskoĭ SSR, Institut Matematiki. Added t-p. in Uzbek. **DWB** (M15.8 G921k).—The hydrodynamic theory is used to develop the various equations necessary for a complete analysis of conditions preceding, during, and following frontogenesis. Five chapters cover: I. Changes in meteorological elements within frontal zones (geostrophic and ageostrophic elements); II. Individual frontogenesis; III. Local frontogenesis; IV. Frontogenesis and vorticity (vorticity equations, conservation theorem, relation between vorticity, frontogenesis, cyclo- and anticyclogenesis); V. Numerical methods of calculating factors of fronto- and cyclogenesis and electronic computers (two layer models, examples of calculation of fronto- and cyclogenesis, examples of precalculation of geopotential heights of isobaric surfaces). Actual 500 mb and surface synoptic and prognostic charts are presented with examples. *Subject Headings:* **1. Frontogenesis textbooks 2. Numerical forecasting textbooks 3. Dynamic meteorology textbooks.**—*M.R.*

12.4–9 551.**582**(47)(02)

*Borisov, A. A., **Klimaty SSSR: posobie dlia uchiteleĭ.** [Climate of the U.S.S.R.: manual for instructors.] 2d ed. Moscow, Gospedizdat, **1959.** 274 p. 44 figs., map (col. fold. in pocket), 42 tables, 21 refs. **DWB** (M821./47 B734k). (For abstract on 1st ed., 1948, *see* 2–156, Feb. 1950, *Met. Abs.*)—The second and greatly revised edition of the climatology of the U.S.S.R. from a regional (geographic) approach but with considerable physical-meteorological-climatic data incorporated. The book is divided into three parts: I. Climatogenetic (climate forming) processes, such as radiation, circulation and moisture exchange, and their close connection with local geographic factors; II. Climatic elements (air and soil temp., moisture, cloud and sunshine, precipitation, evaporation and evaporability, snow cover, and general climatic characteristics of U.S.S.R.) and III. Regional climates (regions of the Soviet Union, oceans,

plains and lowlands, and mountain climates) with emphasis on the U.S.S.R. and adjacent regions. Considerable data, charts, synoptic examples and climagrams are included. *Subject Headings:* **1. Climate of U.S.S.R. 2. Climatology textbooks 3. Regional climatology of U.S.S.R. 4. U.S.S.R.**—*M.R.*

12.4–10 551.5(02)

*Gural'nik, I. I.; Mamikonova, S. V. and Polkovnikov, M. A., **Zadachnik po meteorologii** [Collection of problems on meteorology.] Leningrad, Gidrometeoizdat, **1959.** 251 p. 28 figs., 85 tables+22 in appendix, 16 refs., numerous eqs. **DWB** (M G978za)—A textbook or workbook consisting of thirteen separate chapters, each devoted to problems, aids to their solution, and examples of such solutions. The subjects of the chapters are: 1) time; 2) atmospheric pressure and density; 3) solar and terrestrial radiation; 4) soil and water temp.; 5) air temp.; 6) water vapor; 7) condensation of vapor; 8) precip.; 9) adiabatic processes; 10) wind and air motions; 11) atmos. optics; 12) atmos. acoustics; 13) atmos. electricity. Formulas, tables, charts, nomograms, etc. are included with each chapter. Chapters are subdivided according to various specific phenomena or problems. There are 783 problems to be solved, not counting the numerous examples with solutions given. Appended are extensive conversion and reduction tables and charts or nomograms, and answers to all problems. *Subject Headings* **1. Meteorological textbooks 2. Meteorological workbooks 3. U.S.S.R.**—*M.R.*

A3. MONOGRAPHS

See also: **Analysis of gravity** (U. S. Army Map Serv.), 12.4–165; **Climatic variations** (Regel), 12.4–305; **Climates and landscapes of the past** (Pidoplichko), 12.4–311.

12.4–11 551.58:551.501.5:518.3 551.582:519.24(47

*Lebedev, Alekseĭ Nikolaevich, **Grafiki i karty dlia rascheta klimaticheskikh kharakteristik razlichnoĭ obespechennosti na Evropeiskoĭ territorii SSSR.** [Graphs and charts for the calculation for climatological characteristics within various confidence limits in European U.S.S.R.] Leningrad, Gidrometeoizdat, **1960.** 115 p. 63 figs., 13 tables, 11 refs. At head of t-p.: Glavnaia Geofizicheskaia Observatoriia. **DWB** (M82/47 L442gr)—Nomograms and charts with full explanation of their use, are presented for calculating probabilities of meteorological elements falling within certain limits, based on records of (usually) 30 years or more length—for instance, the period of the year when temp. is above or below −5°, 0°, 10°, or 15° or the monthly, seasonal or annual precip. amount which occurs 20% or 80% of the time. The nomograms can also be used for determining long period normals. Methods of working up the data are described and charts and tables given showing the geographical distribution of the probabilities of such elements within certain confidence limits. About 33 stations are used for minimum temp., first and last frost, monthly, seasonal and annual precip., snow cover dates and duration, sunshine, thunderstorm days as well as the temp. limits indicated above. *Subject Headings:* **1. Climatic probability nomograms 2. Climatic probabilities for European U.S.S.R. 3. Climatic statistics 4. Statistical methods in climatology 5. European U.S.S.R.**—*M.R.*

12.4–12 551.509.33(47) 551.588.1(47

†*Semenov, V. G., **Vliianie Atlanticheskogo Okeana na rezhim temperatury i osadkov na Evropeĭskoĭ territorii SSSR.** [Influence of the Atlantic Ocean upon the temperature and precipitation regime over European U.S.S.R.] Moscow, Gidrometeoizdat, **1960.** 147 p. 34 figs., 35 tables, 158 refs., eqs. **DWB** (M85.1 S471vL)—A detailed monograph on the effect of the temp. of the earth's surface on the atmosphere, the effect of the Atlantic Ocean in particular, the horizontal transfer of air and precip., and temp. fields over European U. S. S. R. Effect of anomalies of sea surface temp. on the thermo-baric fields (relative topography) and subsequently on the circulation indexes and the weather in the U.S.S.R. and, finally, the practical use of the information for monthly forecasting by the asynchronous connection between circulation and air temp. or precip. in European U.S.S.R., forecast preparation and verification. A good bibliography of Russian and Western literature on the Atlantic circulation and its relation to weather is appended. Working tables, graphs, charts, maps, nomograms

etc. are included for use by forecasters. *Subject Headings:* **1. Long range forecasting for European U.S.S.R. 2. Atlantic Ocean influence on European weather 3. Ocean temperature influences 4. European U.S.S.R.**—*M.R.*

12.4–13 551.593.5

*†Feĭgel'son E. M.; Malkevich, M. S.; Kogan, S. Ia. et al., **Raschet iarkosti sveta v atmosfere pri anizotropnom rasseianii, chast' I.** [Calculation of the brightness of light in the case of anisotropic scattering, Pt. 1.] *Akademiia Nauk SSSR. Institut Fiziki Atmosfery, Trudy*, No. 1, **1958.** 101 p. 36 figs., 15+5 tables, 23 refs., numerous eqs. **DWB** (M93.5 A313ra), **DLC.** Transl. into English issued by Consultants Bureau, N. Y. as [*Akademiia Nauk SSSR. Institut Fiziki Atmosfery*], *Transactions*, Vol. 1, **1960.** 104 p. 36 figs., 11 tables (5 in appendix), eqs. **DLC** (QC852.A34A12)—This study of the propagation of light in the terrestrial atmosphere is a contribution to the effort to determine to what extent anisotropy in scattering should be taken into account. Discussion of the mathematical solution of the problem involves the derivation of the basic equations, discussion of zero-order approximation, choice of first approximation and calculation of successive approximations and refers to the effect of albedo of the underlying surface. In considering the treatment of observational data, the treatment of the scattering function is emphasized and the transition from optical thickness to geometrical height is considered. A general discussion of the calculations and some pertinent deductions: on the convergence of series and successive approximations; the dependence of the intensity of the scattered radiation on the altitude of the sun, the transparency of the atmosphere and the form of the scattering function; reflection of light from the earth's surface; flux of scattered radiation; comparison of isotropic scattering; and the role of multiple scattering. Practical use of the tabulated data is explained. The solution of the integrodifferential equations of the theory of radiation transfer in an anisotropically scattering medium was obtained by the method of successive approximations developed by E. S. Kuznetsov (1951). *Subject Headings:* **1. Scattering of light 2. Anisotropic scattering 3. Propagation of light. I. Koronatova, T. D. II. Glazova, K. S. III. Kuznetsova, M. A.**—*E.Z.S.*

A4. MANUALS, HANDBOOKS AND ATLASES

See also: **Radio communication,** 12.4–24.

12.4–14 551.509.33(02)

†*Isaev, E. A., **Katalog sinopticheskikh protsessov nad Atlanticheskim okeanom i Evrazieĭ** [Catalog of synoptic processes over the Atlantic Ocean and Eurasia.] Leningrad, Gidrometeoizdat, **1960.** 151 p. 24 figs., 15 tables+tables in appendix, 16 refs. At head of t-p.: Glavnaia Geofizicheskaia Observatoriia. **DWB** (M09.318 K74ka).—In this manual, the catalog of synoptic weather types appended to the author's 1955 work (*see* 7.11–9, Nov. 1956, *Met. Abs.*), has been expanded and elucidated to include data for more transitional types, duration, frequencies of types, etc., based on 56 years of weather maps for the North Atlantic and Eurasia (1898–1958, except for 1942–45). The 56 pages of text give an explanation of the aims and methods, the mechanisms of seasonal circulation types, statistical data on types, anomalous types, and the possibility of forecasting seasonal types of circulation. The catalog is arranged both by types and chronologically, and finally by seasons. Types are illustrated by selected 500 mb charts and schematic charts of the Multanovsky type. *Subject Headings:* **1. Circulation type catalogs 2. Synoptic types over Eurasia 3. Seasonal forecasting manuals 4. U.S.S.R.**—*M.R.*

12.4–15 63(02) 551.58:63

Virginia Polytechnic Institute. Agronomy Dept., **Handbook of agronomy.** Rev. June **1959.** 167 p. figs. (some in color), charts, tables. **DWB** (620 V817ha)—In addition to the Agronomy Department, several other departments have prepared condensed information on related subjects. The related climatic data appearing at the end of the handbook have been prepared and contributed by the U. S. Weather Bureau. It consists of 13 weather maps and 3 tables. The first 3 maps in order show for the period 1931–1952 in Virginia: annual average precipitation, average precipitation for warm months (April–September), and average annual

snowfall. The following tables list Virginia freezing temperature data. Later, follows a growing season map and maximum, minimum temperature maps. The last map shows tracks of principal tropical storms affecting the state of Virginia (1930–1952). The last table lists mean temperature and precipitation data for Virginia stations. Averages are for period 1931–1955, except for stations marked WB which are "normals" based on period 1921–1950. *Subject Headings:* **1. Climatic data 2. Agroclimatic data handbooks 3. Virginia.**—*I.S.*

12.4–16 551.46:912(261/4)

*Fuglister, F. C., **Atlantic Ocean atlas of temperature and salinity profiles and data from the International Geophysical Year of 1957–1958.** *Woods Hole Oceanographic Institution, Massachusetts, Atlas Series*, Vol. 1, June **1960.** 209 p. 6 p. of text. Almost entirely charts and tables. 31 cm×43 cm. **DWB** (551.46084 W894wo)—The thousands of temperature and salinity observations made during the IGY 1957–58 in systematic cruises of the North and South Atlantic are analyzed and summarized in the form of cross sections or profiles presented in large, multi-color plates. The IGY data were supplemented by other less systematic cruise data obtained in the western North Atlantic by Woods Hole from Sept. 1954–July 1959. Data were obtained by the National Institute of Oceanography of England as well as Woods Hole during IGY. The observational program and method of processing data are described: Trans-Atlantic profiles of surface water (0 to 200 or 250 m depth); temperature (4 belts); temperature profiles for every 8° lat. from 32°S to 24°N and then for 28°, 32°, 36°, 40°, 43/46°, 50/58° N and along 50°W and 66°W long. and in the Caribbean; salinity profiles for the same; actual data from 5 "Atlantis," 1 "Chain," 4 "Crawford," and 3 "Discovery II" cruises and, finally, bathythermograph data for "Atlantis" 247 and 4 "Crawford" cruises are included. *Subject Headings:* **1. Oceanographic atlas for Atlantic 2. Sea temperature-salinity profiles 3. IGY oceanographic data compilations 4. Atlantic Ocean.**—*M.R.*

A5. IGY—ARCTIC—ANTARCTIC

See also: **IGY advances in aeronomy** (Ratcliffe, *ed.*), 12.4-1; **IGY oceanog. data for Atlantic Ocean** (Fuglister), 12.4–16; **IGY geomagnetic program** (Bobrov), 12.4–154; **IGY seismology program** (Tandon), 12.4–173; **Glacial research, Marie Byrd Land** (Wexler), 12.4–185; **Cryoconite holes, Thule** (Gerdel, Drouet), 12.4–282; **Climatic variations, Norwegian Arctic** (Hesselberg, Johannessen), 12.4–307.

12.4–17 551.58(98) 551.584.6 551.586:612.014.4

*Innes-Taylor, Alan (*ed. & comp.*) (*Arctic Consultant for Scandinavian Airlines System*), **Arctic survival guide.** Stockholm, Scandinavian Airlines System, **1957.** 147 p. figs., 5 charts (fold. in pocket) **DWB** (919.8 159ar)—An elaborate illustrated guide to Arctic survival with chapters on regional geography; action to be taken before, during and after an emergency landing on land, sea or ice; first aid (cold, frostbite, snowblindness, sun and wind burn, shock, CO poisoning, use of tourniquets in extreme cold, diseases, psychology, etc.); shelters (microclimatic data in and outside of a snow house, windbreaks, fire making); communications and signals; clothing; hygiene; water and food; foraging; survival equipment; search and rescue (ice islands, joint U. S.-Canadian W. B. stations in Canadian Archipelago and met. stations in Greenland, Arctic Ocean Dew Line and European Arctic); natives and, finally, survival in Antarctica. Folded maps show weather stations, air routes, etc. A brief discussion of climate of each sector of the Arctic is included in the geographical chapter. *Subject Headings:* **1. Arctic survival guides 2. Snow house microclimates 3. Cold effects on man 4. Arctic air routes 5. Arctic 6. Antarctica.**—*M.R.*

12.4–18 551.594.5:551.510.62:621.396.8(98)

*Owren, Leif and Little, C. Gordon, **Arctic radio wave propagation, Task A, Analysis of C-W data, Final Report March 1958.** Alaska. Univ. Geophysical Institute, Contract DA-36-039-Sc-71137, Final Report, **1958.** 101 p. 9 figs., numerous tables. **DWB**—The object of "Experiment Aurora" as conducted June 1949–Oct. 1955 in Alaska was to gain information with regard to the effects of aurora on HF radio signals. The final results are summarized in tables and graphs and discussed. Some of the more salient findings were: no evident correlation

between received signal strength over long paths and the usable frequencies, absorption at large is a daytime phenomenon with its peak at early mid-day hours, variation in HF signal outage time follows variation of sunspots seasonally and annually, outage time as correlated to geomagnetic activity reconfirmed, signal in-time: 4 Mc was better over short paths, 8 or 12 Mc over long paths. It is recommended that: new investigations of HF propagation in and near the auroral zone be based on fresh experiments aimed at combination of pulse techniques including back scatter soundings with measurements of ionospheric absorption based on the extraterrestrial radiation technique, studies of the Luxemburg effect in the Arctic ionosphere be made, forward scattering in field-aligned ellipsoidal ionospheric irregularities be investigated. *Subject Headings:* **1. Auroral effects on radio wave propagation 2. Radio wave propagation 3. Arctic.**—*W.N.*

12.4–19 551.58:631.44(98)

†Tedrow, J. C. F. (*Dept. of Soils, Rutgers Univ.*) and Cantlon, J. E. (*Dept. of Botany & Plant Pathology, Michigan State Univ.*), **Concepts of soil formation and classification in Arctic regions.** *Arctic*, Montreal, 11(3):166–179, **1958.** 11 figs. (incl. photos), 29 refs. **DLC**—Soil formation, as controlled by the interplay of climate, parent material, biotic elements, relief and time, is discussed in relation to the podzolic and the tundra processes as observed at various Arctic regions of Alaska. The relationships between vegetation and soils are considered. Practical soil maps are feasible if cryopedological maps are done separately. Tundra soils form under highly impeded drainage and cannot very well be considered zonal since they reflect the regional climate distinctly. Arctic brown soils are mineral in character and form under drainage; permafrost is deep and with apparent minor influence on soil features. *Subject Headings:* **1. Soil formation 2. Soil classification 3. Arctic.**—*W.N.*

12.4–20 551.506.22 551.5:550.3:061.3(99)

Crary, Albert P. (*Natl. Science Foundation, Wash., D. C.*) **Antarctica.** *American Geophysical Union, Transactions*, 40(4):331–339, Dec. **1959.** fig., refs. **DWB, DLC**—Reviews international conferences which prepared the way for the IGY. The cooperative investigations on Antarctica were the result of the IGY. The author summarizes accomplishments in Antarctica from 1955 to 1959. The scientific accomplishments can be divided into two categories: 1) observations which form a necessary supplement to world-wide data (gravity, earthquake seismology, oceanography, meteorology, upper atmosphere sciences, geomagnetism, ionospheric physics, aurora and cosmic rays; 2) observations connected with the continent itself, particularly glaciology. A brief survey of studies made in the different fields is given. The volume of data is difficult to imagine and, according to Harry Wexler, Chief Scientist of the Antarctic program during IGY, at least 10 years will be required to evaluate the findings. The Special Committee on Antarctic Research (SCAR) was a natural outcome of the international coordination that characterized the IGY. The author indicates future plans which include studies in biology and medical sciences, geology and cartography. A new forward step will be nuclear reactors for power and a land air strip for year around operation. *Subject Headings:* **1. Antarctic research programs 2. IGY Antarctic program 3. Antarctica.**—*E.K.*

12.4–21 551.506.22:551.582(99)

Antarctic meteorological report. *Science*, Wash., D. C., 127(3303):867, April 18, **1958. DLC**—Findings by H. Hoinkes during his stay at the U. S. station Little America, Antarctica, during IGY are briefly reported here. No place receives more sunshine than the South Pole in its midsummer December, however 89% energy is lost by ice reflection. The fine and hard snow grain retards heat absorption and evaporation. The rate of snow dune movement was 6½ ft/hr. The 10,000 year old glacial depositions indicate that Antarctic glacial movement depends on very long climatic cycles only. Temperature difference between surface and 50 ft above was 1–3% during the prevailing 19 knot SE winds. Long wave radiation to a clear sky was responsible for maximum temperature inversions, whereas blocking action by inmoving cloud cover emitting heat rapidly warmed surface even in winter. Minimum possible temperature calculated is −108°F vs. the actually observed −102°F. *Subject Headings:* **1. IGY Antarctic program 2. Antarctic climatology 3. Antarctica. I. Hoinkes, H.** -*W.N.*

12.4–22 551.46(99):551.506.22

*U. S. Hydrographic Office, **Operation Deep Freeze II, 1956–1957: oceanographic survey results.** Wash., D. C., Oct. **1957.** 155 p. 29 figs., 18 plates, numerous tables. **DWB** (919.9 U584u, 1956/1957) —Results of the third consecutive U. S. Navy Antarctic Expedition in support of the IGY are presented. The expedition involved transportation of scientific personnel and equipment to IGY bases, establishment of several secondary bases, and continuation of scientific projects. Data are presented in charts and in tabular form on oceanographic conditions in the Weddell Sea, Ross Sea and Vicennes Bay, Antarctic convergence, ice conditions, bottom sediments, transparency and water color, continuous temperature recordings, deep sea scattering layer and biological collections. *Subject Headings:* **1. Oceanographic surveys 2. Operation Deep Freeze, 1956–1957 3. Antarctica.**—*G.T.*

12.4–23 91.04(99) 551.501.9:551.510.535(99)

Panzarini, Rodolfo (*Dir. Institute*), **La campaña antartica 1950 51.** [The Antarctic season 1950/1951.] *Instituto Antartico Argentino, Buenos Aires, Contribucion,* No. 22, **1959.** 7 p. 5 refs. English summary p. 3. **DWB**—The Antarctic season of 1950–1951 included the period between January and April and the principal task of the expedition was relieve and supply the Antarctic Naval station of Decepción, Melchior and Orcadaes del Sur, to establish a new station in Puerto Paraiso, to give meteorological and navigational support to the expedition "Santa Micaela," etc. A brief chronology is presented and the scientific activities are summarized. Meteorological work involved the preparation of synoptic and forecasting data for operating units and the collection of climatic data. The naval detachment at Decepción established the first permanent Antarctic ionospheric station which was the second Argentinean ionospheric station and observations of critical frequencies were made in the E, Es, F1 and F2 layers. *Subject Headings:* **1. Antarctic expeditions 2. Ionospheric stations 3. South Shetland Islands 4. South Orkney Islands.**—*I.L.D.*

12.4–24 551.509.1:621.396(02)(99)

*International Geophysical Year, 1957/1958, **Antarctic radio communication manual** (rev. ed. Aug. 1957). Comp. by A. H. Sheffield et al. *International Geophysical Year,* **1957/1958,** *Annals,* Vol. 5, (IGY Instruction Manual), Pt. 3, pub. London, Pergamon Press, **1957.** p. 157–244. 3 figs., numerous tables. **DWB** (M06.22 I61ann)—This revised edition has been compiled on the basis of information available on Antarctic radio communication up to Aug. 28, 1956. The material covers, in the main, the radio operating procedure, the mother and daughter stations, the radio stations in alphabetical order, the call signs in alphabetical order, the complete details of Antarctic radio stations, the working group on Antarctic radio transmissions, the regular services of time signals, standard frequencies, the schedule of meteorological broadcasts from Antarctic Weather Central, Little America and, finally, IGY warning messages. *Subject Headings:* **1. Antarctic radio communication 2. Radio communication 3. IGY radio communication manuals 4. Antarctica. I. Sheffield, A. H.** (*comp.*).—*N.N.*

12.4–25 91.04(99)(09) 551.582.2(99) 551.501.9(99)

Doyen, Paulette (*Centre National de Recherches Polaires, Belgium*), **A propos des expéditions antarctiques récentes.** [About the recent Antarctic expeditions.] *Société Royale Belge de Géographie, Bulletin,* 83(3/4):285–298, Dec. **1959.** fig., table.—Short survey of achievements in Antarctica or in the sub-Antarctic islands within the framework of the IGY. Mention is made of the meteorological center at Little America which, during the IGY, centralized the meteorological data, plotted and analyzed weather charts and transmitted the forecasts to all the stations in Antarctica. The Belgian station named Base Roi Baudouin (King Baudouin Base) is installed in Queen Maud Land, an area discovered only between the years 1931–1937 and explored only in a few places. Under the care of the Special Committee on Antarctic Research, Belgium created the National Center for Polar Research. This center analyzes the observations made at King Baudouin Base, prepares the future Belgian Antarctic expeditions and elaborates their programs. The author gives a short historical account of the various expeditions which took place from 1772 to 1922 and of those which were organized between 1930 and 1939 which led to the discovery of Queen Maud Land. In this region, the mean temperature varies from −4° in January to −28° in August, the maximum temperatures

vary from +4°1 to −19°8 and the minimums from −15°4 to −47°C. The mean wind velocity varies from 4 m/sec in December to 10 m/sec in July. The maximum gusts exceed 30 m/sec. The article ends with a short statement of the results obtained by the various expeditions in the fields of topography, glaciology, and geology. *Subject Headings:* **1. History of Antarctic expeditions 2. Climate of Queen Maud Land 3. Weather stations, Antarctica 4. National Center for Polar Research, Belgium 5. Roi Baudouin Base, Queen Maud Land.** —*A. V.*

12.4–26 551.521.1(99)

*Expédition Antarctique Belge 1957/1958, **Météorologie: rayonnement** [Meteorology: radiation], by Xavier de Maere d'Aertrycke and R. Dogniaux. Its *Rapports Scientifiques Préliminaires*, [Unnumbered report], **1959?** 8 p. numerous unpaged tables. 3 figs. **DWB** (M06.5/99 E958ra)—The report consists mainly of tables of measurements of insolation and global radiation taken at the station Roi Baudouin (70°25′S, 24°18′E), on the Princess Ragnhild coast, during Feb. 11 to Dec. 31, 1958 (radiation), and during Feb. 15 to April 31 and Aug. 19 to Dec. 31, 1958 (insolation). The complete semi-hourly observations, along with daily and monthly sums, are given. An introductory section is devoted to a discussion of the observational procedures, with special attention to the instrumental and other types of possible errors. Solarimeters were used for measuring global radiation; and Campbell-Stokes heliographs, for recording insolation. In addition actinometers served to check on the reliability of the solarimetric readings and also to provide measurements of direct solar radiation on days with clear skies. *Subject Headings:* **1. Global radiation data 2. Insolation data 3. Radiation measurement equipment 4. Roi Baudouin Base, Queen Maud Land. I. Maere d'Aertrycke, Xavier de II. Dogniaux, R.**—*R. S. Quiroz.*

12.4–27 551.506.22:551.501.9(99) 551.5:550.3(99)

Dva goda issledovaniĭ v Antarktike. [Two years of investigations in the Antarctic.] *Priroda*, Moscow, 47(2):61–62, Feb. **1958. DLC** —A brief account of the scientific work carried out at the Mirnyĭ geophysical observatory (66°35′S lat; 93°E long) on the shores of Antarctica. Mirnyĭ established the inland stations of Pioneerskaya, Vostok-1 and Kosmomol'skaya. The geographical coordinates of the various stations are given and weather conditions at Mirnyĭ are described briefly. Some of the scientific results indicate that the thickness of the ice cover is greater than hitherto surmised and that Antarctica may not be a unified continent. As a result of numerous atmospheric soundings (1660 by October 1957), temperature-wind observations, etc. it appears that the minimum temperature in the interior of the continent is between −80° and −85°C, and that the formation of glacial winds is associated with considerable cooling of air on the glacier plateau, the air then acquires a downward slope movement under the influence of gravity. The atmospheric pressure is low throughout the entire year. *Subject Headings:* **1. Antarctic meteorology research stations 2. Geophysical stations 3. Soviet Antarctic research 4. Antarctica.**—*I.L.D.*

12.4–28 91.04(99) 551.5:551.46:551.32(99)

Korotkevich, E. S., **Fiziko-geograficheskaia kharakteristika raĭona rabot Sovetskoĭ Antarkticheskoĭ Ekspeditsii 1955–1957 gg.** [The geographical characteristics of the region of the Soviet Antarctic research expedition 1955–1957.] *Vsesoiuznoe Geograficheskoe Obshchestvo, Leningrad, Izvestiia*, 90(3):220–243, May/June **1958.** 16 figs., 12 refs. **DLC**—A comprehensive summary of the physical, geographic and biological characteristics of the area explored by the Soviet Antarctic Expedition 1955–1957, which covered an extensive area of more than 1 million sq km between 74° and 111°E long.—more than 2000 km along the coast and more than 1500 km inland. The author describes the characteristics of the ice cover of Antarctica, the structure of the shelf glaciers which fringe the coasts over a considerable extent (Shackleton and Western Glaciers, etc.), hoonataks, iceberg formations and the properties of the ice crust upon the Antarctic seas; the physical relief and geological structure of the oasis; weathering and permafrost in the oasis; climatic conditions of the oasis including temperature, relative humidity and wind regime; the rivulet system arising from under snow layers, etc. The climatic conditions of vegetation in Antarctica and the characteristics of the lichens, the plankton of fresh water lakes and of the seas along the coasts, and the animal population of Antarctica including molluscs, fish, penguins, seals and whales, are discussed. A map showing

the extent of the area explored and numerous illustrations are presented. *Subject Headings:* **1. Antarctic research expeditions 2. Soviet Antarctic expeditions 3. Antarctica.**—*I.L.D.*

12.4–29 551.513.2(99) 551.582.2(99)

*†Tauber, G. M., **Nekotorye osobennosti atmosfernykh protsessov v Antarktike.** [Some characteristics of the atmospheric processes in Antarctica.] (In: Sovetskaia Antarkticheskaia Ekspeditsiia, 1955–, **Klimat Antarktiki.** Moscow, **1959.** p. 28–78. 18 figs., 20 tables, 32 refs.) **DLC** (QC994.9.K6), **DWB** (M82.1/99 M886kL)—On the basis of a selective and preliminary analysis of the aerometeorological data obtained by the First Soviet Continental Antarctic Expedition 1956–1957, the author presents an analysis of the climatic conditions in Antarctica. With the aid of data presented in tables and synoptic maps and graphs the author examines the radiation regime including radiation balance and albedo, the atmospheric temperature regime including the seasonal and spatial variation of air temperature, the characteristics of the atmospheric circulation in the Indian Ocean sector of Antarctica, the influence of relief upon climate, including air temperature, intensity of wind flow, turbulence aloft, wind direction, snow transport by wind and the temperature and wind regime of the free atmosphere. *Subject Headings:* **1. Atmospheric circulation 2. Climate of Antarctica 3. Antarctica.**—*I.L.D.*

A6. CONFERENCES—SYMPOSIA

See also: **Manned stratospheric labs.**, 12.4–2; **Symposium on Exploration of Space** (Jastrow), 12.4–52; **Cosmic radiation conf.** (Zhdanov), 12.4–120; **Conf. on flash floods, Crimea** (Gol'din, Ivanov), 12.4–288; **Hydrology and lysimetry symposia** (Leyton, Green), 12.4–328.

12.4–30 551.5(213)(08)

Ashford, O. M., **Tropical Meteorology in Africa: Symposium in Nairobi.** *World Meteorological Organization, WMO Bulletin,* 9(2):71–75, April **1960.** 2 photos. **DWB**—A brief account of a symposium held in Nairobi, Kenya, Dec. 1–17, 1959. The symposium was sponsored by the World Meteorological Organization and the Munitalp Foundation. The first week of the symposium was devoted to discussion of synoptic meteorology with an initial series of three lectures each by A. G. Forsdike and N. E. LaSeur. A brief summary of the contributions of these and other speakers is given. The subject of climatology was introduced by H. Flohn in a series of three lectures dealing with the structure of the intertropical convergence zone, the significance of the equatorial westerlies over Africa, and the physical causes of climatic fluctuations in the tropics. Among the hydrological problems discussed were the global water balance and hydrometeorological factors in limnological studies. The influence of forests and other vegetation covers was discussed by H. C. Pereira and J. S. G. McCulloch of the East African Agricultural and Forestry Research Organization. Papers on the agricultural uses of meteorological data, services to aviation, the location and use of wind power, plants and locust control, were read. The full proceedings of the symposium are being published. *Subject Headings:* **1. Meteorological symposia 2. Synoptic meteorology 3. Climatology of Africa 4. Hydrology 5. Agricultural meteorology 6. Applied meteorology 7. Nairobi, Kenya.**—*E.Z.S.*

12.4–31 551.588.6:628.1

Friedrich, Wilhelm (*ed.*), **Wald und Wasser: Bericht über die Aussprachetagungen des Arbeitskreises "Wald und Wasser" in Hilchenbach, 1955 und in Zwiesel, 1958.** [Forest and water: report of the meeting of the Forest and Water Working Group in Hilchenbach in 1955 and in Zwiesel in 1958.] *Arbeitskreises "Wald und Wasser," Mitteilungen,* Coblenz, No. 3, **1959.** 76 p. figs., and photos. (All articles abstracted separately.) **DWB** (M:634.9 A664mi)—In the introduction to this report, the editor describes the activities of the Wald und Wasser (Forest and Water) Working Group, which consists of foresters and hydrologists engaged in problems of joint interest. The first meeting was held in 1953 at Constance, the second one in 1955 at Hilchenbach (Siegerland), and the third in 1958 at Zwiesel. This report contains a number of papers presented at the last two meetings and not published elsewhere. *Subject Heading:* **1. Forest-water resources relationships.**—*I.L.D.*

12.4–32 550.3:551.5:061.3

Pippan, Therese (*Salzburg*), **Bericht Über den V. Internationalen Kongress der Inqua in Madrid-Barcelona vom 2. bis 16. September 1957.** [Report on the 5th International Conference of Inqua in Madrid-Barcelona, Sept. 2–16, 1957.] *Zeitschrift fur Gletscherkunde und Glazialgeologie*, Innsbruck, 4(1/2):145–150, 1958. **DWB, DLC**—The Congress was attended by delegates from 32 countries. Well over 200 lectures were given in German, English, French, Spanish and Russian languages. The program was divided into 12 Sections, 5 Commissions and 1 Symposium. The Sections dealt with the topics of astronomy, geophysics, climatological soil science, glaciology, hydrology, limnology, paleontology, paleoanthropology, paleoethnology, paleochronology, paleoclimatology and regional, quaternary, and submarine stratigraphy. Also discussed was pleistocene tectonics. *Subject Headings:* **1. International Conference of Inqua 2. Geophysical conferences.**—*W.N.*

12.4–33 551.510.522:061.3

Pokrovskaia, T. V., **Nauchnaia sessiia Glavnoĭ geofizicheskoĭ observatorii im. A. I. Voeĭkova po probleman meteorologii prizemnogo sloia vozdukha.** [Scientific session on problems of meteorology of the layer of air near the ground, at the Voeĭkov Geophysical Observatory.] *Akademiia Nauk SSSR, Izvestiia, Ser. Geog.*, No. 5:139–142, Sept./Oct. 1957. **DWB**—At this meeting, which was held May 7–10, 1957, the physics of the atmosphere up to a height of 1 or 1.5 km was discussed and unique meteorological observations obtained in Antarctica (at Mirny, winter of 1956), in the central Arctic deserts, in the mountains of Central Asia, in the virgin lands of the U.S.S.R., etc., were presented. Summaries are given of the more important papers delivered. These were as follows: **Experimental and theoretical study of the lower layer of the atmosphere,** M. I. Budyko; **Meteorological processes in the layer of the atmosphere near the ground in Antarctica,** N. P. Rusin; **Experimental data on the structure of the atmosphere near the ground in the central Arctic,** D. Laĭkhtman; **Heat balance of reservoirs and methods of determining evaporation,** M. P. Timofeev; **Studies on the microclimate and heat balance of sand deserts in the Pamir,** M. V. Zuev; **Principles of the microstructure of temperature and wind in the atmosphere near the ground,** A. M. Obukhov; **Formation of the temperature regime of water reservoirs,** V. S. Samoilenko; **Aerological investigations of the atmosphere near the ground,** P. A. Vorontsov; **Physical principles in the formation of fogs,** V. Ia. Nikandrova; **Local forecasting of temperature and humidity changes in the atmosphere layer near the ground,** M. E. Berliand; **Instruments for investigating the meteorological regime in the layer near the ground,** N. V. Kucherov and M. S. Sternzat; **Consideration of microclimatic characteristics in the location of agricultural crops,** F. F. Davitaia; **Temperature of the active surface and its bioclimatic significance,** M. I. Budyko; **Characteristics of the meteorological regime of the layer near the ground in the regions of virgin and waste land,** I. A. Gol'tsberg; and **Investigation of the climatic forming processes according to observations at a single point,** A. P. Gal'tsova, etc. *Subject Headings:* **1. Air layers near the ground. 2. Physics of the atmosphere 3. Antarctica 4. Arctic 5. Central Asia.**—*I.L.D.*

12.4–34 551.5:061.3

Schweitzer, H., **Tagung der Deutschen Meteorologischen Gesellschaft 1958.** [Meeting of the German Meteorological Society, 1958.] *Umschau*, Frankfurt a.M., 58(20):633, Oct. 15, 1958. **DLC**—A report of a meeting of the German Meteorological Society held in the middle of September at Garmisch in connection with the International Meeting of Alpine Meteorology. Twenty papers were presented dealing with: heat and water balance, aerosol research and problems of aerological synoptics. Brief summaries are given of the following papers: **Present status of the heat balance problem** (Rudolf Geiger); **Wind profiles over a disturbed lake** (K. Brocks); **Physical properties of atmospheric nuclei, nuclei of continental and oceanic origin, atmosphere purification, etc.** (H. Georgi); **Carbon-dioxide measurements in Vienna and in the mountains** (F. Steinhauser); and **Problems of aerological synoptics** (H. Flohn). *Subject Headings:* **1. Meteorological conferences 2. Heat and water balance 3. Aerosol research 4. Aerological synoptics.**—*I.L.D.*

12.4–35 551.5:061.3

Poliakova, E. V., **Itogovaia sessiia uchenogo soveta Glavnoĭ geofizicheskoĭ observatorii im. A. I. Voeĭkova.** [Final session of the learned council of the Voeĭkov Central Geophysical Observatory.] *Meteorologiia i Gidrologiia*, Leningrad, No. 6:64–65, June **1958. DWB, DLC**—At this session, which was held on Jan. 27–31, 1958 and which was concerned with the final fulfillment of the plan of scientific work completed in 1957, the Research Institutes of the Hydrometeorological Service and the Institute of the Academy of Sciences of the U.S.S.R., etc. participated. The papers delivered included the following: calculation of the relative humidity and evolution of cloudiness during winter; development of the theory of thermal anomalies; the relationship of the spectral characteristics of atmospheric turbulence with meteorological conditions; geographical distribution of turbulence zones important in aviation; heliographic relationships and their utilization in forecasting intra-monthly temperature variation, etc. Other papers dealing with calculation of depth of soil freezing, the physics of clouds, fog studies, etc. are listed and the names of the authors of the various papers are given. *Subject Headings:* **1. Meteorological seminars 2. Leningrad, U.S.S.R.**—*I.L.D.*

12.4–36 550.3:061.2(439.1) 551.24:92

Savarenskiĭ, E. F., **IV Mezhdunarodnaia konferentsiia Vengerskogo geofizicheskogo obshchestva.** [Fourth International Conference of the Hungarian Geophysical Society.] *Akademiia Nauk SSSR, Izvestiia, Ser. Geofiz.*, No. 3:502–504, March **1959. DLC**—The Fourth International Conference of the Hungarian Geophysical Society took place in Budapest Sept. 10–13, 1958. The conference dealt with the study of the earth's crust and allied problems. The titles of the papers presented and their authors are listed. Special attention was devoted to the structure of the earth's crust in Hungary; it was found that the earth's crust in Hungary is apparently about 5–7 km thinner than in the rest of Europe. The contributions of Lorand Eötvös (1848–1919), the Hungarian geophysicist, to geophysics in Hungary are summarized briefly. Brief descriptions of the geophysical observatory in Tikhara and of the research being carried on in this observatory, of research carried out at L. Eötvös Geophysics Institute, etc. are presented. *Subject Headings:* **1. Geophysical conferences 2. Structure of earth's crust 3. Eötvös, Lorand.**—*I.L.D.*

12.4–37 523:061.3

Danjon, André, **La X^e Assemblée Générale de l'Union Astronomique Internationale.** [The 10th General Meeting of the International Astronomical Union.] *L'Astronomie*, Paris, 73(4):145–153, April **1959.** 2 figs. **DLC**—Account of the 10th General Meeting of the International Astronomical Union held at Moscow from 12–20 of Aug. 1958. Author gives a short statement of recent discoveries reported in the papers presented at Moscow. One notes particularly the following items: altitude observation of solar granulation, research relating to the distribution of energy in the ultraviolet continuous spectrum of the sun, influence of solar eruptions on cosmic rays, distribution of electrons at various levels of the ionosphere, energy sources in the upper atmosphere, spectrum of the night sky and of polar auroras, and celestial mechanics of artificial satellites. *Subject Heading:* **1. International Astronomical Union Meeting, Moscow, Aug. 1958.**—*A.V.*

A7. SERVICES—OBSERVATORIES

See also: **Hawaiian Volcano Obs.** (Macdonald), 12.4–169.

12.4–38 551.501.89:551.509.311:656.7 551.501.81:551.509.5

Tsyganov, G. P., **Opyt meteorologicheskogo obsluzhivaniia raĭonnoĭ dispetcherksoĭ sluzhby i ispol'zovaniia radiolokatsionnoĭ stantsii RUPOR na AMSG Rostov-na-Donu.** [Experiments with a meteorological service for a regional dispatching service and the use of radar stations RUPOR on AMSG at Rostov on the Don.] *Meteorologiia i Gidrologiia*, Leningrad, No. 6:46–47, June **1957. DWB.** Transl. into English by Valys Zilius, issued by the American Meteorological Society, under Contract AF 19(604)-1936, as its T-R-219, Aug. **1959.** 4 p. Complete.—The method of providing weather forecasts for airplanes in flight, including the

forecasting and communication procedures employed at Rostov-on-Don, is described and examples in which radar station reports on thunderstorm development aided the establishment of the height level on the route of Rostov-Stalingrad planes are presented. The value of radar in weather forecasting and the development of thunderstorms as viewed on the radar screen are discussed. *Subject Headings:* **1. Radar weather forecasting 2. Radar aids to navigation 3. Aeronautical weather forecasting 4. Rostov-on-Don, Rostov Region, U.S.S.R.** —*I.L.D.*

12.4–39 551.58(047)

World Meteorological Organization, **Progress report on national climatological activities, 1953–1957.** 52 p. **DWB** (M(06) W927pr) —Report from 54 countries to the Secretary-General of the World Meteorological Organization, on climatological activities in each country. There has been striking progress toward the conversion of statistical work to machine methods. The use of punched cards has become more widespread in Argentina, Australia, Belgium, British East Africa, Canada, Egypt, Federal Republic of Germany, France, Ghana, Israel, Tunisia, United Kingdom, U. S., Union of South Africa and in 8 other countries. Research work is also reported. *Subject Headings:* **1. WMO progress report 2. Climatological methodology 3. Progress in climatology.**—*N.N.*

A8. EDUCATION—HISTORY—BIOGRAPHY—BIBLIOGRAPHY

See: **Hist. of Antarctic expeditions** (Doyen), 12.4–25; **Cosmic ray discovery,** 12.4–119.

BIOGRAPHY

See also: **Obit. of T. A. Jaggar** (Macdonald), 12.4–169.

12.4–40 551.5:92

Seilkopf, Heinrich (*Hamburg*), [**Obituary of**] **Professor Dr. Kleinschmidt, Sept. 5, 1877–Aug. 5, 1959.** *Meteorologische Rundschau,* Berlin, 12(6):169–170, Nov./Dec., **1959. DWB, DLC**—The academic and scientific career of Ernst Kleinschmidt is summarized. He began his meteorological career as an assistant of Hergesell at the Strasbourg Meteorological Institute. In 1908 he became director of the Friedrichshafen kite station on Lake Constance where he conducted aerological observations. In 1926 he became director of the Deutsche Seewarte in Hamburg. His contributions and interest extended to the entire field of meteorology, in particular aerology and instrumentation. *Subject Headings:* **1. Obituary of Ernst Kleinschmidt 2. Kleinschmidt, E.**—*I.L.D.*

12.4–41 551.58:92 550.38:92

Kalesnik, S. V., **Zhizn' i tvorcheskiĭ put' Aleksandra Gumbol'dta: k stoletiiu so dnia smerti.** [Life and works of Alexander von Humboldt: Centenary of his death.] *Vsesoiuznoe Geograficheskoe Obshchestvo, Leningrad, Izvestiia,* 91(4):313–323, July/Aug. **1959.** 11 refs., 5 foot-refs. **DLC**—The author presents an account of the life of Alexander von Humboldt, of his travels to South America, to Russia and of his scientific contributions. A brief outline and evaluation of his principal work **Cosmos** are presented. His contribution to climatology was the introduction of the method of isotherm, the concepts of continental and marine climates and the encouragement of meteorological and magnetic observations. *Subject Headings:* **1. Biography of Alexander von Humboldt 2. Humboldt, A. v.**—*I.L.D.*

Bibliography

See also: **Radioactive fallout bibliogs.** (Voress et al.), 12.4–86.

12.4–42 551.5:016:681.177

Haake, G. R. (*Meteorologischer und Hydrologischer Dienst der DDR, Potsdam*) **Auswertung meteorologischer Literatur, insbesondere unter Verwendung maschineller Verfahren.**

[Evaluation of meteorological literature, especially with application of mechanical devices. *Zeitschrift für Meteorologie*, Berlin, 11(9):273–279, Sept. 1957. 8 figs. **DWB, DLC**—The author describes a simple and inexpensive mechanical sorting procedure for meteorological literature. It involves the use of a ten row columnar punch card in which the vertical space between two holes are punched out. Every hole corresponds to a number and by combining several rows the capacity of the card is increased. To avoid the inadequacy of the decimal classification a subject list of meteorological concepts (decimal classification, *Met. Abstr. and Bibliog.*, etc) was compiled. These were arranged into seven groups and three additional groups, comprising time and place, author names and titles of periodicals were added. The coding of a specific meteorological item is illustrated. The selection of cards either manually by means of needles or by means of a sorter is described. Photographs of the punched cards, cards with needles for manual selection and of a mechanical sorter are presented. *Subject Headings:* **1. Meteorological literature searching 2. Information retrieval 3. Punched cards.**—*I.L.D.*

12.4–43 551.5:63:016 551.5:634.9:01

†Poland. Państwowy Instytut Hydrologiczno-Meteorologiczny, **Bibliografia z zakresu meteorologii rolniczej i lesnej.** [Bibliography in agricultural and forest meteorology.] Warsaw, **1958.** 124 p. Refs. arranged alphabetically by author under subject groups. Titles given in Polish, Russian and French. Author index, p. 120–122. List of Polish publications analyzed, p. 7–8.—The bibliography contains 649 items listed in alphabetical order by author's name under the following 12 main subject headings: I. Meteorology and climatology (125 items); II. Local climate and microclimate (52); III. Soil climate (83); IV. Atmospheric influence on yield (135); V. Agroclimatic regions (6); VI. Ground amelioration (64); VII. Agricultural and forestry services (5); VIII. Methods of observations (42); IX. Phenology (56); X. General works (66); XI. Bibliographies (4) and XII. Obituaries (11). The bulk of the entries are compiled from Polish periodicals (listed) and the entry titles are given in Polish, Russian and either English, French or German. Author index and a general subject index are provided. The compilation was made by L. Bartnicki, Chief of the General Climatology Section at the Institute. *Subject Headings:* **1. Bibliography on agricultural meteorology 2. Bibliography on forest meteorology. I. Bartnicki, L.** (*ed.*)—*W.N.*

12.4–44 551.509.6:551.573:01

†Magin, George B., Jr. and Randall, Lois E., **Review of literature on evaporation suppression.** *U. S. Geological Survey, Professional Paper*, 272-C, **1960.** p. 53–69. 322 refs., eqs. On t-p.: Studies of evaporation. **DWB** (M73 M194re)—Evaporation suppression is the reduction of evaporation by controlling the rate at which water vapor escapes from water surfaces. The need for water saving is greatest in areas of little rainfall and low runoff. Water losses by evaporation from storage reservoirs must be minimized for greatest utility of limited supplies. A review of the literature shows that evaporation can be retarded by either physical or chemical means. It can be controlled by enclosure in a building, application of plastic covers, oil films, and monomolecular films. Monomolecular films hold the greatest promise for use on large areas of water such as reservoirs. From the literature available it is apparent that these films introduce many chemical and physical problems. The suppressants must be nontoxic and odorless, especially if used on water-supply reservoirs. They should allow the free exchange of oxygen so that aquatic life is not endangered. The effects of waterborne bacteria on these films and the effects of the films on water of different qualities are not fully known. The physical problem of detecting the presence of the film has not yet been solved. Of the monomolecular films that have been investigated, the waxy alcohols such as hexadecanol and octadecanol show the greatest promise. *Subject Headings:* **1. Evaporation suppression 2. Evaporation suppression from reservoirs.**—*Author's abstract.*

12.4–45 551.510.62:551.510.52:621.396:016

†Nupen, Wilhelm and Thuronyi, Geza, **Checklist of references to literature on tropospheric propagation of UHF, VHF, and SHF radio waves, 1918–1957.** Prepared by Meteorological Abstracts and Bibliography of the American Meteorological Society. *U. S. National Bureau of Standards, NBS Report*, No. 6001, Aug. 26, **1958.** 174 p. 702 items (many with abstracts).

DWB—Over 700 items are listed alphabetically by author (subject and geographic indexes are provided). They include the over 300 abstracts published previously in the two bibliographies appearing in the September and October 1957 issues of *Meteorological Abstracts and Bibliography*, as well as additional items with or without abstracts. The subject matter is limited to meteorological and topographic effects upon high frequency (300-30,000 Mc) tropospheric propagation. *Subject Headings:* **1. Tropospheric radio wave propagation bibliographies 2. UHF radio wave propagation 3. VHF radio wave propagation.**—*G.T.*

12.4–46 551.582.3(63,635,677):016

†Grimes, Annie E. (*comp.*), **Bibliography of climatic maps for Ethiopia, Eritrea, and the Somalilands.** Wash., D. C., U. S. Weather Bureau, Jan. **1960.** 10 p. 39 titles. **DWB** (M(016) U587bet)—This bibliography is prepared from sources in the Weather Bureau Library, The Library of Congress and The Department of Agriculture Library. It gives sources with abstracts. Sources by classification, number and by subject heading are also listed. *Subject Headings:* **1. Bibliography of climatic maps 2. Ethiopia 3. Eritrea 4. Somaliland.**—*I.S.*

B. APPLICATIONS

B1. AERONAUTICS

See also: **Runway light range** (Best), 12.4–337.

12.4–47 551.524.2:629.13

*Harrison, Henry T. (*Weather Res. Group, United Air Lines, Denver, Colo.*), **The use of mean surface temperatures in jet flight planning.** *United Air Lines, Inc., UAL Meteorology Circular*, No. 50, Sept. 1, **1959.** 228 p. (6 p. of text, incl. listing of airport stations and bibliog.) 3 figs., 200 charts, 12 refs. **DWB**—"Presents general guide lines to assist flight operations and engineering personnel in the long range planning of jet aircraft whose operating characteristics are modified by variations in surface temperature on take-off. Data (from 228 airports) should also be useful to meteorologists and flight dispatchers in short range planning for allowable gross loads 3 or more hours in advance of take-off. Temperature figures intended primarily for use with DC-8's and Boeing 720's. One page of text gives suggestions for use of the data, citing a flight set up in June to operate from Chicago to San Antonio at 0500 CST on Aug. 1 and return from San Antonio to Chicago same day at 1400 CST, the problem being to estimate the payload that can be carried." *Subject Headings:* **1. Jet flight planning 2. Surface temperature effects on jet take-off.**—*Author's abstract.*

12.4–48 551.551.5:629.13

Zbrozek, J. K. (*Royal Aircraft Establishment, Bedford*), **Some effects of atmospheric turbulence on aircraft.** *Weather*, London, 13(7):215–227, July **1958.** 8 figs., 6 eqs. **DWB**—The present knowledge of atmospheric turbulence as applied by the aerodynamicist in design of various types of aircraft is summed up in this theoretical discussion. The discrete gust concept and its shortcomings are demonstrated. Application of the continuous gust concept, or rather the branch of harmonic analysis involving the power spectra technique, is shown. This method, with all the advantages to an aeronautical engineer, still remains a challenge to the meteorologist in predicting reliably the statistical properties of gusts. *Subject Headings:* **1. Turbulence effects on airplanes 2. Gust forecasting.**—*W.N.*

12.4–49 551.551.5:629.13

Engel, Jerome N. and Copp, Martin R. (*both, Langley Res. Center, Langley Field, Va.*), **Analysis of acceleration, airspeed, and gust-velocity data from a four-engine transport airplane operating over a northwestern United States-Alaska route.** *U. S. National Aeronautics and Space Administration, NASA Memo* 1-17-59L, Feb. **1959.** 15 p. 4 figs., 4 tables, 8 refs. **DWB** (629.1388 U584me)—Acceleration, airspeed, and altitude data obtained with an NACA VGH recorder from a four-engine commercial transport airplane operating over a northwestern

United States-Alaska route were evaluated to determine the magnitude and frequency of occurrence of gust and maneuver accelerations, operating airspeeds and gust velocities. The results obtained were then compared with the results previously reported in *NACA Technical Note*, No. 3475 for two similar airplanes operating over transcontinental routes in the United States. No large variations in the gust experience for the three operations were noted. The results indicate that the gust-load experience of the present operation closely approximated that of the central transcontinental route in the United States with which it is compared and showed differences of about 4 to 1 when compared with that of the southern transcontinental route in the United States. In general, accelerations due to gusts occurred much more frequently than those due to operational maneuvers. At a measured normal-acceleration increment of 0.5 g, accelerations due to gusts occurred roughly 35 times more frequently than those due to operational maneuvers. *Subject Headings:* **1. Gustiness 2. Gust load on airplanes 3. Gust velocities 4. Northwestern United States-Alaska air route.**—*Authors' abstract.*

12.4–50 551.557.5:629.13

§Cronin, John G. (*Sr. Eng., Meteor., Cook Res. Labs., Morton Grove, Ill.*), **Some practical applications in flying western and central Pacific jetstreams.** *Navigation*, Los Angeles, 6(4):217–233, **1959.** 12 figs. **DWB, DLC**—Flying the three jet streams in the Pacific Ocean area individually and in combination and under various approaches and synoptic conditions is discussed and illustrated in vertical north-south cross sections of the (1) Arctic jet stream, (2) the Interpolar (fresh Polar) jet stream and (3) the Old Polar (subtropical) jet stream. Optimum flight planning dependent on meteorological forecasts is subjected to adjustments in flight because of a natural limit of accuracy of the forecasts and the encountering of adverse weather. A guide to determine rapidly an advantageous change of flight track by the pilot-navigator or the in-flight navigator is given. The meteorological aspects are discussed with emphasis on what the pilot-navigator should watch for in temperature at flight altitudes of the jet stream. *Subject Headings:* **1. Jet stream flying 2. Optimum flight planning 3. Pacific Ocean.**—*W.N.*

12.4–51 551.511.12:551.576.4

Demianczuk, Piotr Pawel (*Inst. Hydrologique et Météorologique d'Etat, Poland*), **La hauteur de la base des nuages Cu et Cb en Pologne.** [The height of the lower boundary of Cu and Cb clouds in Poland.] *Schweizer Aero-Revue*, Berne, 34(1):55, Jan. **1959.** 2 refs., table. **DLC**—The author establishes a formula to determine the height in meters of the lower boundary of clouds above the flight: $h = A(t_0 - \tau_0)$, where: $A = 1/\gamma - \beta$, γ = dry adiabatic gradient,

$$\beta = \frac{1}{1/E(\tau_0) \cdot [dE(\tau_0)/d\tau_0]_{\tau_0=\tau_0'}} \cdot \frac{g}{RT_{w,s}}$$

$E(\tau_0)$ = saturation vapor pressure for the dew point $\tau_0 = \tau_0'$ at the airport, g = acceleration of gravity, $T_{w,s}$ = mean virtual temperature in the interval 0–1500 m. The application of this formula for calculating the lower boundary of cumulus and cumulonimbus in some places in Poland has given results which agree well with the direct measurements carried out by the pilots of sail-planes with the aid of altimeters. *Subject Headings:* **1. Cloud height 2. Poland.**—*A.V.*

B2. ASTRONAUTICS

See also: **Satellite obs.**, 12.4–2; **Astronautics**, 12.4–3; **Natural earth satellites** (Schubart), 12.4–109; **Satellite research** (Lovell), 12.4–159; **Cloud patterns as seen from Tiros I** (Conover, Sadler), 12.4–274.

12.4–52 523.7(08) 523.3(08) 629.19(08)

Jastrow, Robert (*Natl. Aero. & Space Admin., Wash., D. C.*), **Symposium on the Exploration of Space: introductory remarks.** *Journal of Geophysical Research*, Wash. D. C., 64(11): 1647–1651, Nov. **1959. DLC**—The first nationally sponsored conference devoted to space physics was held April 29–30 in Washington, D. C. The first session dealt with fields and

solid particles in the solar system and the second session with the several aspects of space exploration. Brief comments on the 12 papers and the three round-table discussions are given. (For listing of these 12 papers, *see* Pt. III, p. 152, Jan. 1960, *Met. Abs.* These papers abstracted separately.) *Subject Headings:* **1. Solar physics conferences 2. Space exploration conferences.**—*W.N.* Ⓢ

12.4–53 550.3:551.507.3

Massey, H. S. W. (*Chairman, British National Committee on Space Research*), **Space research.** *Contemporary Physics*, London, 1(2):81–95, Dec. **1959.**—Space research is defined as the scientific study of the earth and the universe generally which may be carried out using instruments conveyed by the use of rocket motors to regions inaccessible in any other way. This is a review paper of such research. The technical problems involve: 1. the rocket motor; 2. a guidance mechanism; 3. precise tracking techniques; 4. the development of suitable measuring instruments; 5. power supply for instruments; 6. relaying observation back to earth. Investigations which may be carried out include: 1. study of the high atmosphere; 2. meteorological studies; 3. gravitational and magnetic studies; 4. astronomical observations; 5. particle radiations in interplanetary space; 6. study of the nature of any matter in interplanetary space; 7. study of the moon and planets *in situ*; 8. investigation of the nature of gravitation. *Subject Heading:* **1. Space research.**—*R.B.* Ⓢ

12.4–54 629.19:061.3(47)

Krieger, F. J. (*Rand Corp., Santa Monica, Calif.*), **Soviet astronautical program.** *Astronautics*, N. Y., 4(7):43, 78, July **1959.** fig., port. (incl. vita). **DLC**—In the last few years the Soviet Union has made great strides into outer space. Once Soviet scientists solve the complex interdisciplinary problems, other technological advances in conquest of space will follow. By 1967 Soviet astronauts may reach the moon. Recently, a Soviet scientist outlined a plan to conquer space. The program, which is in three phases, involves the creation of a series of earth satellites, conquest of the moon and, finally, the conquest of other planets of the solar system. *Subject Headings:* **1. Soviet astronautics 2. Astronautics research and development.**—*A.H.K.* Ⓢ

12.4–55 551.508.953:551.507.362.2:551.510.535:551.594.12

Istomin, V. G., **Mass-spektrometricheskie izmereniia ionnogo sostava verkhneĭ atmosfery na tret'em iskusstvennom sputnike Zemli.** [Mass-spectrometric measurements of the ion composition of the upper atmosphere by the third artificial earth satellite.] *Akademiia Nauk SSSR, Doklady*, 129(1):81–84, **1959.** 4 figs., 3 refs., eq. **DLC**—The spectra of the mass of positive ions of the ionosphere were investigated on the third artificial earth satellite by means of a radio-frequency mass spectrometer of the Bennet type. Measurements were made at altitudes of 225 to 980 km and between 27°–65°N latitude. All the measurements were daylight observations, i.e., ion spectra of the atmosphere illuminated by the sun were obtained. All the ionospheric peaks in the spectra were shifted in the scale of mass of the apparatus on the side of light masses because of the velocity of the satellite and its negative charge. The formula for determining the mass number of a peak is presented. In all spectra the peak with prevailing intensity had a mass number close to 16, so that it was identified with atomic oxygen O^+; second in intensity was a peak with mass number 14 identified with atomic nitrogen N^+. A weak peak with mass 18 was attributed to ions of the oxygen isotope with a weight of 18 [$(O^{18})^+$]. At perigee spectra showed heavy atoms with mass numbers of 32, 30 and 28. The most intense among these was the peak with mass number 30 identifiable with NO^+. The intensity of the peak of atomic N in relation to that of atomic O varied as a function of height and geographic latitude between 1.3 and 8–10%. Graphs showing the variation of relative intensity of ionic peaks of atomic N as a function of height and geographic latitude are presented. *Subject Headings:* **1 Satellite ionospheric observations 2 Mass spectrometer analysis 3 Ionospheric ionization 4. Positive ions in ionosphere.**—*I.L.D.* Ⓢ

12.4–56 551.521.64:551.507.362.1

Vernov, S. N.; Chudakov, A. E.; Vakulov, P. V. et al., **Mechta radiation data.** *Astronautics*, N. Y., 4(7):23, 86–88, July **1959.** 2 figs. **DLC** The cosmic rocket launched by the

Soviet Union on Jan. 2, 1959 carried equipment to record cosmic rays and terrestrial corpuscular emission. Two Geiger counters and two scintillation counters detected particles. Preliminary processing of data to a distance range of 8000–150,000 km from Earth's center is also described. The maximum radiation intensity is reached at a distance of about 26,000 km from the earth's center. The electron spectrum is not constant at various altitudes. *Subject Headings:* **1. Cosmic ray data 2. Rocket radiation data. I. Logachev, Iu. I.**—*A.H.K.* Ⓢ

12.4–57 551.507.362.1:551.521.64

Vernov, S. N.; Chudakov, A. E.; Vakulov, P. V. et al. (*all, Acad. Sci., Moscow*), **Izmereniia radiatsii pri polete vtoroĭ kosmicheskoĭ rakety.** [Radiation measurement during the flight of the second space rocket.] *Akademiia Nauk SSSR, Doklady*, 130(3):517–520, **1960.** 2 figs. table, 3 refs. **DLC.** Also in *Iskusstvennye Sputniki Zemli*, Moscow, No. 5:24–29, **1960. DLC.** Eng. transl. in *Space Science Symposium, Nice, Jan. 1960 Space Research; proceedings of the First Symposium.* Pub. **1960.** p. 845–851. Russian summary p. 845. **DWB** (523.7 161sp)—The apparatus for measuring radiation installed on the second cosmic rocket shot off towards the moon on Sept. 12, 1959 is itemized and described briefly. It consisted of 6 gas discharge counters and 4 scintillation counters. The preliminary results of measurements obtained within a distance of 9 to 120 thousand km from the center of the earth and in the lunar region beginning with 40 thousand km from the surface of the moon are presented. Data on the spatial disposition of the external radiation belt indicate a deformation of the zone of high intensity on Sept. 12 relative to its position on Jan. 2, 1959. This deformation of the radiation belt is associated with the variable nature of solar corpuscular currents and with the variable nature of the particle injection in the zone of high intensity. Data on the existence of two energetic groups of particles, namely electrons with energy of ~20 kev and electrons with energy of ~1 Mev (or protons with energy of ~10 Mev). The intensity of radiation did not increase within 10% of the cosmic background radiation up to a distance of 1000 km from the lunar surface. It is estimated theoretically that at heights >1000 km the ratio of radiation intensity in a hypothetical lunar radiation belt to the intensity of maximum outer belt of the earth is less than 10^{-6} and for 0–1000 km less than 10^{-4}. After issuing from the external radiation belt of the earth beginning with 70 thousand km from the earth's center a constant radiation intensity was recorded. The apparatus outside the container indicated a reduction in the impact of secondary radiation formed by the action of cosmic rays on the surrounding matter. *Subject Headings:* **1. Rocket measurement of cosmic rays 2. Van Allen belts 3. Soviet space probe 1959 (Lunik II). I. Logachev, Iu. I. II. Nikolaev, A. G.**—*I.L.D.* Ⓢ

12.4–58 551.507.362.2

Vichney, Nicolas, **Tiros I, prélude à un réseau de satellites météorologiques.** [Tiros I, prelude to a network of meteorological satellites.] *La Nature*, Paris, No. 3301:185–188, May **1960.** 3 figs. **DLC**—Tiros I (Television and Infra Red Observation Satellite) launched on April 1, 1960 is able to observe cloud formations; it is the first space vehicle able to take without interruption views of an important part of the terrestrial globe. This achievement proves that three problems have been solved in a satisfactory manner: precision of the trajectory, orientation of the space vehicle with respect to the earth and radio and television equipment. The author discusses these three points and describes the satellite equipment. He believes that seven satellites of the Tiros I type would constitute a complete network of meteorological satellites. *Subject Headings:* **1. Satellites 2. Meteorological satellite networks 3. Tiros I**—*A.V.* Ⓢ

12.4–59 551.507.362.1:52(

Mickelwait, Aubrey B. (*Space Tech. Lab., Los Angeles*), **Rocketry.** *American Geophysical Union, Geophysical Monograph*, No. 4:53–57, **1959.** 3 eqs. **DWB, DLC** (QB275.C64 1958)—The main reason a rocket cannot be useful in geodesy is that a rocket spends very little time in orbit outside the Earth's atmosphere and there are a very limited number of places from which to launch them and a very limited set of azimuths into which to launch them. Important uncertainties are pointed out. Panel participants Fred L. Whipple, Charles A. Lundquist, Hellmut Schmid and others continued the discussion of the usefulness of rocketry

in geodesy. *Subject Heading:* **1. Rocket uses in geodesy. I. Whipple, Fred L. II. Lundquist, Charles A. III. Schmid, Hellmut.**—*E.Z.S.* Ⓢ

12.4–60 551.507.362.1:521.12:529.77

Lipps, F. W. (*Instrument Res., Inc., Cambridge, Mass.*), **A Farside-type rocket experiment for the measurement of the gravitational time effect.** *Journal of Geophysical Research*, Wash., D. C., 65(2):786–787, Feb. **1960.** fig., 3 refs., eqs. **DLC**—Results comparing a clock in a Farside rocket with a clock on the equator and a curve showing the negative Doppler contribution are calculated and plotted. *Subject Headings:* **1. Rocket investigations 2. Chronometry 3. Gravitational time effect.**—*E.Z.S.* Ⓢ

12.4–61 551.507.362.1:621.396.676

New Mexico. State Univ. Physical Science Lab. University Park, New Mexico, **Split missile antenna, 400 Mc command control notch antenna, The three element slot array and bent-dipole nose probe, Quadraloop antenna at S-band, Telemetry and command control antennas, [and] Radio frequency breakdown measurements on quadraloop antennas.** Contract AF 19(604)-2188, Final Report, April 28, **1960.** 11 p. 6 refs.—Details given of work done and services performed in connection with: 1) engineering services toward rocket antenna installation for data transmission in Aerobee and Cajun rockets; 2) laboratory studies lending to the development of antenna designs; and 3) propagation studies lending to the determination of radiation characteristics, voltage breakdown and heating problems associated with rocket antenna configurations. *Subject Heading:* **1. Rocket antennas.**—*I.S.* Ⓢ

12.4–62 551.501.7:535.8 551.507.362.2

Shklovskiĭ, I. S., **Opticheskie metody nabliudeniia iskusstvennykh sputnikov Zemli.** [Optical methods of observing artificial earth satellites.] *Iskusstvennye Sputniki Zemli*, Moscow, No. 1:44–49, **1958.** 2 figs., 4 refs. **DLC.** Transl. into English issued in *Artificial Earth Satellites*, Vol. 1, issued N. Y., Plenum Press; London, Chapman & Hall, **1960.** p. 55–63. 2 figs., table. **DWB** (629.1388 A791ar)—Optical methods facilitate more exact determinations of the spatial coordinates of artificial earth satellites and give the true angular coordinates. The coordinates can be obtained by photographing the image of the satellite and the surrounding stars. An adequate light intensifying system of large diameter with a sensitive photographic plate makes it possible to observe very faint artificial satellites. Observations against the background of twilight must be made with short exposures, and a sufficient number of star images is obtained by employing electronic optical intensifiers. The system of SCHMIDT provides the best degree of resolution. Larger and brighter satellites require simpler photographic apparatus using objectives of smaller diameter. The elimination of difficulties in recording exactly the moment of opening and closing the shutter is described. The determination of coordinates by means of a slit in the focal plane of an objective with a photoelectric cell behind the slit is described. The position of the slit relative to the images of stars in the focal plane is determined photographically. The slit can be cut in an emulsion of a photographic plate and the stars are then photographed on the plate. In case of a faint satellite that cannot produce any trace on a photographic plate it is necessary to have two systems of differently oriented slits whose positions are tied in with the stars. This may be achieved by two paired chambers in which the slits are mutually perpendicular, or one chamber may have two systems of crossed slits of different widths so as to distinguish the impulses from them. The impulses are recorded by means of a photoelectric installation. The coordinates of faint satellites can be determined by means of instruments with relatively small diameter if electron-optical transformers are used. By means of such systems it is possible to increase the sensitivity of photographing by 100 times that of the best photographic emulsions. A method for increasing the brightness of the satellite by using a polygonal rather than a spherical satellite surface is described. Each surface being highly polished forms a plane mirror capable of reflecting solar rays which can be observed as very bright flares of light of very short duration. The use of this technique, including the problem of establishing the moment of the flare, the danger due to interference of micrometeors, etc. are discussed. *Subject Heading:* **1. Satellite optical observation techniques.**—*I.L.D.*

12.4 63 551.501.81:551.507.362.2 523.164.42:523.44 551.507.362.2:621.396

Swerling, P. and Crain, C. M., **A possible transponding system for an artificial asteroi** *Rand Corporation, Santa Monica, Calif., Project Rand Research Memorandum,* RM-217 May 14, **1958.** 35 p. fig., 3 tables, 5 refs., 34 eqs. **DWB** (507.2 R186r)—The measuremer of transmission path length to an artificial asteroid by radio frequency transponding techniqu has been suggested as a means of increasing the precision with which the dimensions of th solar system are known. This report describes the design of a possible pulsed transpondi system by which the transmission path length could be measured with an accuracy limite essentially by the accuracy with which the velocity of light is known—i.e. about one part in 10 Typical values of range and radial velocity with respect to the earth of the proposed artifici asteroid are assumed. All assumed components are presently available. A weight and volun breakdown of a possible design is given, which indicates that the necessary asteroid-borr transponding equipment, with associated power sources, could be accommodated in a 15 pour package occupying about 900 cubic inches. *Subject Headings:* **1. Transponders 2. Asteroic borne transponding equipment 3. Artificial asteroids.**—*Authors' abstract.*

12.4–64 551.510.53:

Potter, Pitman B., **International law of outer space.** *American Journal of Internation Law,* 52(2):304–306, April **1958.** 10 foot-refs. Also: Haley, Andrew G., **Law of outer space a problem for international agreement.** *American University Law Review,* 7(2):70–77, Jur **1958.** 17 foot-refs. **DAU**—State representatives and international lawyers are challenge by the following problems with regard to legal aspects of space: Can any state enforce a jurisdiction in space? At which altitude does space begin and end? Mankind, on the thres old of the age of space communication, must start with an international agreement for th exploration of the known and the unknown space. The authors of these papers are cautious considering application of terrestrial laws to literally extra-terrestrial problems that must b solved. *Subject Headings:* **1. Space law 2. Outer space law 3. Legal aspects of outer spac** —*W.N.*

12.4–65 551.507.362.2:06(7

Pickering, W. H., **United States satellite tracking program.** *American Geophysical Unio Geophysical Monograph,* No. 2:133–141, **1958.** 8 figs., 5 refs. **DLC**—The importance accurate knowledge of the satellite orbit in geophysics, factors influencing orbital motion a needed accuracy of the orbit in order for it to be useful, are discussed briefly and a detaile account is given of the procedures and techniques for visual and radio tracking of the thir stage of the satellite. The organization of the Moonwatch program and of amateur rad stations is described. The construction and operation of the satellite camera, which is Schmidt type camera with a special film transport mechanism designed for satellite trackin and the Minitrack system designed to track the very weak transmitted signal from the satellit are described with the aid of diagrams and photographs. Procedures of orbital computatio from the tracking data and the properties of the path of the satellite are summarized. *Subje Headings:* **1. Satellite tracking program 2. Minitrack system 3. Satellite orbits 4. Moor watch program 5. U. S. satellite tracking program.**—*I.L.D.*

B3. SHIPPING

12.4–66 551.509.1(4

Seilkopf, Heinrich, **Dreistündliche Ausgabe von Wetterberichten für Hamburg und d Unterelbe im Fernsprechansagedienst Hamburg.** [Three-hourly issuance of weather repor for Hamburg and the Lower Elbe in the Hamburg telephone reporting service.] *Der Wette lotse,* Hamburg, No. 129:73–76, April **1958.** 2 figs. **DWB, DLC**—As of March 1, 1958, se weather reports made around the clock every 3-hours from 0220–2320 central European tim can be had over the telephone. The territories covered are Helgoland, F S "Elbe 1," Gru hafen, Bremen, Kiel, Lübeck, and Hannover. The service is popular within shipping circl as well as with the public planning sailing trips, etc. *Subject Headings:* **1. Telephonic weath forecasts 2. Forecasting for shipping 3. Germany.**—*W.N.*

12.4–67 551.509.322:656.65(7:285)

Sik, A. E. (*Radio Marine Section, U. S. W. B.*), **Weather Bureau service for Great Lakes shipping during the 1958 navigation season.** *Mariner's Weather Log*, Wash., D. C., 3(3):76–77, May **1959. DWB**—Brief description of the valuable service performed by the U. S. Weather Bureau in connection with Great Lakes shipping during the 1958 navigation season. Reference is made to a series of eight weekly ice summary bulletins issued by the Detroit Office of the Weather Bureau. The March 3 bulletin predicted mid-April as the probable opening time for ports which proved to be a very reasonable estimate. Beginning on April 15, the U. S. Weather Bureau commenced the issue of Great Lakes weather forecasts, weather bulletins and warnings for the 1958 season. These weather services continued until the termination of the season on Dec. 15, 1958. Mention is also made of a simplified system of warning signals introduced for use at U. S. display stations. During the 1958 season three important storms affected Great Lakes navigation. The history of each storm is briefly sketched. *Subject Headings:* **1. Forecasting for shipping 2. Meteorological services 3. Great Lakes.** *I.S.*

12.4–68 551.506:551.507.22

Whiting, Georgia C. (*Natl. Weather Records Center, U. S. W. B.*), **Ship's weather observations, Pt. 2, Cooperative observations program development.** *Mariner's Weather Log*, Wash., D. C., 2(2):31–34, March and 2(6):179–182, Nov. **1958.** fig., 2 photos. **DWB**– Cooperative weather observation at sea was advanced with the development of shipboard radio sending apparatus in 1902. But it was not until 1928 that the beginning of an international unified system of radio-transmitted weather messages was instituted. Numerous improvements in cooperative weather observations and the transmission of weather information from 1902 until 1928 are mentioned. By 1929 a program was adopted whereby each participating country was to arrange to have a certain number of ships take daily observations at fixed hours and to transmit them by radio. Ships selected had standard surface meteorological equipment and long range radio apparatus. The professional weather service began in 1936–1937 when Britain placed a meteorologist aboard a cargo steamer on the North Atlantic trade route, an example which was followed by some other countries only sporadically until Sept. 1946 when the international agreement, to establish thirteen permanent Atlantic Ocean station vessels not later than July 1, 1957, was signed by Belgium, Canada, Denmark, France, Iceland, Eire, Netherlands, Norway, Portugal, Spain, Sweden, United Kingdom and the United States. *Subject Headings:* **1. Marine meteorological observations 2. Weather ships 3. Cooperative ocean weather observation.**—*E.Z.S. and W.N.*

B4. AGRICULTURE

See also: **Agronomy handbooks,** 12.4–15; **Bibliog. on agric. and forest met.,** 12.4–43; **Sr^{90} in plants** (Romney et al.), 12.4–82; **Wind machines for frost protection of orchards** (Georg), 12.4–256; **Freezing temps. in late spring and early fall** (Pierce), 12.4–257; **Late spring and early fall low temps., Texas** (Blood, Hildreth), 12.4–302.

12.4–69 551.524.3:634.94:666.92

*†Fuss, Franz, **Einfluss der Kalkung auf die Temperatur von Baumstämmen im Winter und Frühjahr.** [Influence of a lime coat on the temperature of tree trunks in winter and spring.] *Angewandte Meteorologie*, Berlin, 3(10):295–311, April **1960.** 12 figs., 8 tables, 30 refs. German and English summaries p. 295. **DWB**—In connection with the study of the susceptibility of early blooming species of deciduous fruit trees to late frost, a case study of two sweet cherry species was made to investigate the influence of a lime coat upon temperatures of the cambium zone and the stem's interior. Temperatures were taken by a six-fold recorder using thermocouples and an amplifier unit. In comparison with a tree of the same kind which has, however, no coating such a lime layer causes, under insolation, a remarkable reduction of temperatures. In the absence of sunshine and generally at night-time temperatures of a coated stem are, as a rule, somewhat lower due to heat supply from insolation of the non-coated stem being greater as compared to a tree provided with a lime coat. *Subject Headings:* **1. Tree trunk temperatures 2. Lime coat effects on tree trunk temperatures 3. Cherry trees.**—*Author's abstract.*

B5. MEDICINE

See also: Radioactive hazards, 12.4–81; Effects of mountains and sea on groups of patients (Jungmann), 12.4–325.

12.4–70 551.586:615.838(43)

Hesse, F. (*Nordeney*), **Klimabehandlung an der Nordsee bei Intoxikationen durch Blei- und Industriegifte und Veränderungen des Elektrophoresenbildes im Blutserum.** [Climatotherapy at the North Sea for intoxications from lead and industrial poisons and changes in the electrophoretic picture of blood serum.] *Annalen der Meteorologie, Medizin-Meteorologische Hefte*, No. 13:31–32, **1958. DWB**—Observations on cancer patients at a North Sea resort showed a gradual normalization of protein metabolism and of electrophoresis values of the blood serum. Patients suffering from lead poisoning and benzol damage showed in the course of a climatic cure at Nordeney a general amelioration of subjective complaints and unequivocal changes in laboratory findings, namely: rise in hemoglobin values and normalization of the hemoglobin metabolism, diminution of basophilic erythrocytes, diminution or disappearance of coprophyrin in the urine and increase of lead content of blood without manifestation of poisoning symptoms and diminution of lead content of blood and urine below initial values. In the case of benzol damage, leucopenia was abolished in all cases. Also 42 cases of silicosis treated at Nordeney showed an improvement in accompanying bronchitis and in electrophoretic blood picture. It is believed that the water insoluble quadrivalent lead (Pb^{+4}) in the base system is transformed into bivalent lead (Pb^{+2}) by the low pH values (high salt content of air) and is then excreted. *Subject Headings:* **1. Climatotherapy 2. Seaside resorts 3. Nordeney, Germany.**—*I.L.D.*

12.4–71 551.586:312.26(431.1)

Hentschel, Gerhard (*Inst. f. Kur- und Badewesen und f. Physikalische Therapie, Bad Elster*), **Untersuchungsergebnisse der Sterblichkeit unter verschiedenen lokalen Gegebenheiten.** [Results of a study of mortality under various local conditions.] *Zeitschrift für Meteorologie*, Berlin, 13(1/6):33–44, Jan./June **1959.** 14 figs. German and English summaries p. 33. **DWB, DLC**—This paper concerns the physiological importance of air pollution originating from industrial processes and urban activities. A diagram showing the occurrences of diseases in the GDR districts draws attention to the particularly unfavorable situation encountered in areas strongly affected by industrial exhaust gases. A detailed study of the rate of mortality under the regime of various synoptic patterns (Grosswetterlage) reveals that in highly contaminated areas the rate of mortality increases remarkably under high atmospheric pressure, i.e., when there is a pronounced horizontal stratification of the atmosphere which renders more difficult or even prevents the replacement of air inside the biosphere. The usual meteorological parameters, associated with frontal activities, are apparently of less concern to the aforementioned processes, which corroborates the findings on the relations of exogeneous milieu to death causes. *Subject Headings:* **1. Mortality due to weather 2. East Germany.**—*Author's summary.*

12.4–72 551.586:615.834

Harnack, Klaus (*Univ.-Hautklinik der Charité, Berlin*), **Vergleichende Untersuchungen bei Klimakuren der Universitäts-Hautklinik der Charité.** [Comparative studies of the results of climatic treatments as carried out at the Charity University Dermatological Clinic.] *Zeitschrift für Meteorologie*, Berlin, 13(1/6):124–129, Jan./June **1959.** 2 figs., table, 13 refs. German and English summaries p. 124. **DWB, DLC**—This is a report on the experiences made in applying climatic cures mainly to patients suffering from atopic dermatitis, psoriasis vulgaris, or akne vulgaris. Details are given on successful treatments and of course, the unavoidable failures after cures made at the Black Sea, in Obergurgl (the Tyrol), on the Fichtelberg in Heiligendamm, and particularly at Kap Arkona (Rügen) where a branch climatic hospital had been established by the Berlin University Dermatological Central Hospital on July 15th 1958. Climatological data were made available by permission of the Kap Arkona meteorological station, regular weather maps being used. From July 15th to Nov. 25th 1958 a total of 150 patients were given climatic treatment at Kap Arkona. *Subject Headings:* **1. Climatotherapy 2. Skin diseases.**—*Author's summary.*

12.4–73 551.586:615.834(43)

Grimm, H. (*Berlin-Biesdorf*), **Diskussionsbemerkung zur Frage der Objektivierbarkeit des Kureffektes an der Seeküste.** [Further remarks on the problem of the possibility of an objective evaluation of results of a sea-side resort treatment.] *Zeitschrift für Meteorologie*, Berlin, 13(1/6):94, Jan./June **1959. DWB, DLC** – The results of tests of the so-called "Flimmermethode" (glimmering method), as applied in 6800 measurements to children of both sexes, of ages 10–12 and 13–14 at the camp at Trassenheide/Usedom during July–August 1958, are described and analyzed. *Subject Headings:* **1. Climatotherapy 2. Seaside resorts 3. Trassenheide/Usedom, Germany.**—*O.T.*

12.4–74 551.586:612.1

Giordano, A. (*Italy*), **Blood sedimentation rates (a study of the influence of environment).** *International Journal of Bioclimatology and Biometeorology, Leiden*, Vol. 1 (Pt. 4, Human Bioclimatology), **1957.** 2 p. 2 figs.—In this study of the rate of erythrocyte sedimentation, samples were placed in a closed copper tube (*D*), kept in the open air (*F*) and kept in the open air but wrapped in black paper. The tests were carried out from mid-May 1957 and July 17, 1957. At the outset *D* was faster than *F* but this was reversed on May 28 and until June 10 *D* and *F* were close together. Subsequently constant and considerable differences were observed. These differences are attributed to the environment, when weather was fine differences were slight; but with the onset of thunderstorm they became much greater. In theory *F* values should be influenced by geomagnetic disturbances, solar eruptions and the electric potential of the atmosphere; *D* values by solar activity (Wolf number) and cosmic rays. *Subject Headings:* **1. Human bioclimatology 2. Sedimentation of erythrocytes.**—*I.L.D.*

12.4–75 551.586:612.11

Giordano, A., **Differentiated erythrocyte sedimentation rate.** *International Journal of Bioclimatology and Biometeorology*, Leiden, Vol. 2, pt. 4, 1958. 3 p. 8 refs., 2 figs. "Continuation of studies pub. by author in the same journal, Vol. 1, part 4, Sec. C-1, 1957."—Erythrocyte sedimentation rate (E.S.R.) was investigated by placing similar samples of blood in entirely closed and grounded copper containers, in the open air and in the open air but wrapped in black paper. In these tests the main datum was the maximum difference in sedimentation rate between the enclosed (D) and open air (F) samples. In stormy weather with winds over 30 km/hr there was always a considerable difference between D and F; and while in D sedimentation proceeded regularly in F it was so rapid that flocculation was approached at a level difficult to determine. In such cases the presence of black paper was usually sufficient to bring sedimentation back to normal. In settled weather the differences were slight or non-existent. This phenomenon was particularly marked if blood is used from persons with a very high sedimentation rate as in the case of cancer after prolonged ionizing treatment. *Subject Headings:* **1. Human bioclimatology 2. Sedimentation of erythrocytes.** —*I.L.D.*

12.4–76 551.586:615.834 551.586:613.11(234.5)

Fuchs, F. and Hentschel, Gerhard, **Höhenklimatherapeutische Möglichkeiten und Erfahrungen bei Neurodermitis const.-Kranken auf dem Fichtelberg.** [Possibilities and results of treating neurodermitis constitutionalis by means of high altitude climate on Fichtelberg Mountain.] *Zeitschrift für Meteorologie*, Berlin, 13(1/6):116–123, Jan./June **1959.** 3 figs. German and English summaries p. 116. **DWB, DLC**—The authors submit evaluations of temporary successes of high elevation cures (1130 m above MSL), covering one year. A survey on recidivists allows these results not to be considered as of but temporary nature; it is, moreover, found that patients are free from recidivism for a longer period of time than conventional hospital treatment may offer. There is not only one cause for these results. It is, however, most probable that, on the whole, a particularly important part is played by UV-radiation, which is more intense as compared to flat-country conditions, by low absolute humidity frequently coinciding with high relative values, by considerably decreased air temperatures, and by the low rate of air pollution. Continuous measurements of body temperatures and serological examinations show that, with but small time variations as to the respective courses, a real acclimatization is effected after a four weeks period. *Subject Headings:* **1. Cli-**

matotherapy 2. Acclimatization 3. Mountain resort sites 4. Fichtelberg Mt., Germany.—*Authors' abstract.*

12.4–77 551.586:551.510.42:581.16

Dingle, A. N.; Gill, G. C.; Wagner, W. H., Jr. et al. (*all, University of Michigan*), **The emission, dispersion, and deposition of ragweed pollen.** *Advances in Geophysics*, N. Y., Vol. 6, pub. 1959. p. 367–387. 10 figs., table, 10 refs., 6 eqs. **DWB, DLC**—Ragweed (*Ambrosia*) plants grown in the greenhouse and later in cold frames are induced to pollinate under field conditions in June, well before the regular pollination season in August and September; this early pollination is aided by manipulation of the photoperiod. In June 1956 pilot field experiments were successfully conducted, and in June and July 1957 the behavior of pollen from over three thousand ragweed plants arranged in a circular plot 26 ft in diameter in an open field was studied. An array of suitably prepared microscope slides arranged concentrically around the ragweed plot was used to determine the deposition of pollen during a ten-day period. The array was as follows: ninety slides outside the ragweed plot, each at a height of 2 ft above the ground; and eight slides in the plot, four on the ground and four located 2 ft directly above. Meteorological elements measured include wind direction and speed, lapse rate, cloud amount, visibility, precipitation, and maximum and minimum temperature. The variation of pollen emission with meteorological variables is analyzed and illustrated and the observed patterns of pollen deposition are compared with those anticipated from a highly simplified model of dispersion and deposition of particles from a circular area source. The paper concludes with a brief description of the experiments conducted in June 1958, which were designed to evaluate vertical dispersion from an identical source, and with a discussion of the broad significance of investigations of this type. *Subject Headings:* **1. Weather effects on ragweed pollen 2. Ragweed pollen count variations.**—*Authors' abstract.*

12.4–78 551.586:615.834

Cordes, Ch. (*Eisenvitriol- u. Moorbades Bad Lausick*), **Bemerkungen zur Objektivierung von Kurergebnissen.** [Remarks on the objective evaluation of the results of health resort treatments.] *Zeitschrift für Meteorologie*, Berlin, 13(1/6):106–107, Jan./June 1959. **DWB, DLC**—The influence of subjective factors on the objective behavior of the results of health resort treatments is emphasized. The symbiosis between bioclimatology and medicine, being already in steady development, by the thoughtful activity of some meteorologists and physicians led to the establishment of forest belts or to elimination of unfavorable local climatical influences. The application of measurement methods for reproducible correlations between treatment results, climate, and weather is suggested. *Subject Headings:* **1. Bioclimatology 2. Health resorts.**—*O.T.*

12.4–79 551.586:613.7(43-11)

Carl, F. E. (*Deutsche Bauakademie, Berlin*), **Bioklimatologie und Erholungsplanung.** [Bioclimatology and recreational planning.] *Zeitschrift für Meteorologie*, Berlin, 13(1/6):77–80, Jan./June 1959. German and English summaries p. 77. **DWB, DLC**—A survey is given on the efforts toward comprehensive holiday planning in the German Democratic Republic, and on the inclusion of bioclimatology into district and country planning from the point of view of a recreational service. *Subject Headings:* **1. Bioclimatology 2. Recreational climatology 3. East Germany.**—*Author's summary.*

B6. RADIOACTIVITY

See also: **Radioactivity-weather relationships** (Styra), 12.4–220; **Study of atmos. diffusion with radioactive silver iodide** (Sänger, Carreras), 12.4–233; **Solar gamma ray investigations,** 12.4–244; **Transport of Sr^{90} in runoff** (Menzel), 12.4–286.

12.4–80 551.510.7:662.2:539.1

*Reiter, Reinhold, **Zum Einfluss der natürlichen und künstlichen Radioaktivität des Aerosols auf luftelektrische Elemente unter Berücksichtigung des Grades der Luftverunreini-

gung. [Influence of natural and artificial radioactivity of aerosols on atmospheric electrical elements taking into account the degree of air pollution.] *Zeitschrift für Aerosol-Forschung und -Therapie*, Stuttgart, 8(1):1–23, Jan. 1959. 7 figs., 4 tables, 18 refs.—Tabulated results of observations at Farchant at-Garmisch-Partenkirchen, May 1957–July 1958. While it is clear that there exists a relation between natural radioactivity and air pollution on one hand and atmospheric electricity on the other, there is no proof that nuclear explosions influenced weather in Germany. *Subject Headings:* **1. Nuclear explosion effects on weather 2. Germany.** —*W.N.*

12.4–81 551.510.721:662.2:539.1

Fallout hazards assessed by AEC group. *Science*, Wash., D. C., 129(3360):1413–1414, May 22, 1959. **DLC**—It is reported that the amount of fission products injected into the stratosphere by all nuclear tests in 65 megatons TNT corresponding to about 100 pounds of Sr^{90}—50% of this Sr^{90} has already fallen out. The amount of total body external radiation is less than 5% of the estimated average radiation exposure of the American public to X-rays for medical purposes. As regards internal effects of Sr^{90} due to ingestion, its amount found in food and water is less of a hazard than the amount of radiation in the drinking water supply in the U. S. The responsibilities of AEC are discussed with regard to radiation safety. It is reported that AEC has established in addition to world-wide sampling of air, soil, foods and water, an effective biological and medical research program in the general field of radiation hazards and protection. *Subject Headings:* **1. Radioactive fallout hazards.** —*I.S.* Ⓢ

12.4–82 551.510.721:662.2:539.1:633

Romney, E. M.; Ehrler, W. L.; Lange, A. H. and Larson, K. H., **Some environmental factors influencing radio strontium uptake by plants.** *Plant and Soil*, The Hague, 12(1):41–48, Jan. 1960. 5 tables, 18 refs. **DLC**—The amounts of Sr^{90} taken up from Vina soil varied among several different crop plants by a factor of 10 on the basis of dry weight. The relative decreasing order of Sr^{90} uptake by mature plant tops was turnip = millet > Swiss chard > Ladino clover > broccoli > soybeans > barley > oats > wheat > spinach. For each of the cereal crops, the concentration of Sr^{90} in grain was only about one-fifth of the Sr^{90} in forage. The tubers of White Rose potato grown on Sassafras, Handford and Sorrento soils contained only about one-fiftieth of the Sr^{90} concentrated in the tops. The Sr^{90} uptake by the potato was inversely correlated with the level of plant-available calcium in Sassafras, Handford and Sorrento soils. Lowering of root temperature from 17° to 7°C significantly reduced Sr^{90} uptake by barley and beans during a 24-hour absorption period. Q 10 values indicated that strontium uptake was chemically controlled rather than the result of physical phenomena. A decrease in light intensity from 1000 to 450 foot-candle significantly reduced Sr^{90} uptake by barley and beans. The uptake of Sr^{90} also was reduced as the light exposure period was decreased. One-third to one-half of the total amount of Sr^{90} obtained during a 24-hour absorption period was taken up independent of exposure of light. *Subject Headings:* **1. Radioactive isotopes 2. Strontium^{90} fallout 3. Strontium^{90} in plants.**—*Authors' abstract.*

12.4–83 551.510.7:574.6

Michon, M. G., **Les cycles biologiques des pollutions radioactives.** [Biological cycles of radioactive pollution.] *Revue de Pathologie Générale*, Paris, 59(707):505–514, April 1959. 2 figs., 3 tables. French, English and Spanish summaries. **DA, DNLM**—Artificial radio-elements (synthesized for scientific or industrial purposes) having been released, may be absorbed by plants or animals, and may eventually involve a catenation of organisms. All organisms living in a polluted river become more radioactive than the water, which is to be expected, inasmuch as organisms are hypertonic in respect to sweet water. On the contrary, soil brings into play physico-chemical phenomena (absorption) so that plants can get only a small portion of contaminating radio-elements. The animals feeding on such plants are relatively less exposed to contamination, and carnivorous animals feeding on herbivorous animals are still less exposed. Man, is fairly well protected, whereas lower organisms, particularly unicellular organisms, may suffer (mutations, etc.). *Subject Headings:* **1. Radioactive pollution 2. Biological cycles.**—*Author's abstract.*

12.4–84 551.510.7:551.574.1

†Potsius, V. Iu., **Metodika issledovaniia radioaktivnosti oblachnykh elementov α-radiograficheskim metodom.** [Methods of investigating the radioactivity of cloud elements by α-radiography.] *Lietuvos TSR Mokslų Akademija. Geologijos ir Geografijos Institutas, Moksliniai Pranešimai*, 10(1):63–80, **1959.** 3 figs. (1 fold), 4 tables, 31 refs., 9 eqs. Lithuanian and English summaries p. 76–77. –Some authors indicate the fact that clouds may play a particular role in removing pollutants from air. That is why the experimental investigations of cloud elements may be of great importance in solving the problem of the removing of radioactive contamination from the atmosphere. However, there was almost no thorough study of the radioactivity of cloud elements so far. The subject of the given work was the methods of the investigation of local cloud-elements radioactivity and of studying the radioactivity of single cloud droplets by means of aircraft soundings. In the first stage of the work the cloud drops were caught on filter paper by means of an originally constructed collector (see Fig. 1). Changing the exposure of the collector-lock, it was possible to take single cloud droplets or to collect general drop samples from different zones of clouds. The minimum diameter of the drops caught by this collector was as much as $d_{\min} = 5\mu$. Afterwards a study of the radioactivity of cloud-droplets caught on filter paper, using contact-radiographic methods (14), followed. Measuring the length of α-tracks and determining the distribution of their density in emulsion, the nature of radioactive materials and their concentration in cloud elements were established. In order to obtain more accuracy in measuring α-tracks, the initial thickness of nuclear emulsion was achieved by soaking it in glycerin solution. In determining α-radioactive elements according to the length of α-tracks in emulsion, it was estimated that using A-2 nuclear photo-plates the Ilford C-2 emulsion calibration curve may be made use of (14). The method used in this work opens large prospects for the study of the radioactivity of cloud-elements. This paper gives the first results achieved by this method. The greatest concentration of radioactive materials was observed in the droplets samples taken in the center of cumulus cloud (see Table 2). The α-radiographic analysis of cloud droplets radioactivity is also given in the article. *Subject Headings:* **1. Radioactive clouds 2. Scavenging by cloud elements 3. α radiography.**—*Author's abstract.*

12.4–85 551.510.721:551.577.7

*Dorporto, Mariano, **Deposition of airborne radioactive particles and the cleaning effect of precipitation at Valentia.** *Eire. Meteorological Service, Technical Note*, No. 27, April **1960.** 9 p. 3 figs., 6 tables, 3 refs., eqs. **DWB**—Nearly three years of measurements of the specific radioactivity of precipitation made at Valentia Observatory (Ireland) have been used to calculate the mean values for the first, second and third day after at least one day without precipitation. The observations were divided into two groups covering the periods before and after the practice was introduced of washing after dry days the surface of the rain collector. Mean values for different daily amounts of precipitation have also been computed. Mean values of airborne radioactivity have been calculated for days without measurable precipitation and for days with less than or equal to, and for greater than the median value of the daily precipitation. From these data and making reasonable assumptions, which should apply on the average, it has been found that the deposition of radioactive particles on dry days amounts to 20%, and the pollution collected by the first day's rain to 62% of the specific radioactivity of the precipitation observed on the second or third day; the specific radioactivity contained originally in the cloud drops is as high as 80%. The results are not only consistent within themselves but also provide some derived values, such as deposition velocity of particles, which are generally in agreement with those obtained elsewhere or appear to be reasonable. *Subject Headings:* **1. Radioactive fallout computation 2. Precipitation effects on radioactivity 3. Valentia, Ireland.**—*Author's abstract.*

12.4–86 551.510.721:016

†Voress, Hugh E.; Smith, Richard J. and Jacobs, James M. (*comp.*), **Radioactive fallout: a bibliography of selected United States Atomic Energy Commission reports.** *U. S. Atomic Energy Commission, TID*-3087, Aug. **1959.** 74 p. **DWB**—A total of 365 annotated references to unclassified AEC reports is presented on the physics and chemistry of fallout, its effects upon human life, and all other major aspects of the subject. Author, subject, and report

number indexes are provided. *Subject Headings:* 1. Radioactive fallout bibliographies. **I. U. S. Atomic Energy Commission.**—*Authors' abstract.*

12.4–87 551.510.7

Georgescu, Paul and Bratu, Cristian, **Contaminarea radioactiva a aerului atmosferic.** [Radioactive contamination of the atmosphere.] *Meteorologia, Hidrologia şi Gospodărirea Apelor*, Bucharest, 4(1):5–11, 1959. 2 figs., 44 refs. Russian, French and English summaries p. 77–79. **DWB** Based on a rich bibliographic material, the paper shows the danger represented by radioactive contamination of the atmospheric air. There are indicated the main sources and ways of contamination, apparatuses and frequent methods of determining atmospheric radioactivity as well as certain methods of decontamination. In conclusion, the paper underlines the importance of the meteorological studies in order to prevent these contaminations. *Subject Heading:* 1. **Radioactive pollution of atmosphere.**—*Authors' abstract.*

B7. INDUSTRY

12.4–88 551.582(431.7) 551.586:711.16

Böer, Wolfgang (*Met. und Hydrolog. Dienst, Deutscher Demokratischer Republik*), **Klimaforschung im Dienste des Städtebaues.** [Climatic investigations in municipal engineering.] Berlin, 1954. 59 p. 19 figs., 7 tables, 15 refs. At head of half-title page: Deutsche Bauakademie Schriften des Forschungsinstitutes für Städtebau. **DLC** (NA9050.B6)—Meteorological aspects directly influencing successful planning and construction of municipal housing developments are discussed in simple language as a guide for contractors and architects. The following topics are discussed and accompanied with useful graphs and tabulated data: significance of climate to municipal engineering, radiation, air temperature, water content of the air, cloud formation, precipitation, aerosols, wind, air masses, zonal climates, climate of Eastern Germany, annual mean temperature and precipitation, local climate, cold sinks, influence of forests and fields, insolation, city climate, application of climatological values to single and multiple house construction. *Subject Headings:* 1. **City planning** 2. **Architectural climatology** 3. **Engineering meteorology** 4. **Eastern Germany.**—*W.N.*

12.4–89 551.5:331.221

Crow, Loren W. (*Consulting Meteorologist, Denver, Colo.*), **What are some of the economic possibilities for the younger meteorologist?** *American Meteorological Society, Bulletin*, 40(8):389–393, Aug. 1959. **DWB, DLC**—Even with a sizable expansion in numbers, the typical professional meteorologist is a salaried governmental employee. This is in sharp contrast to several of the other professions. The predominant salary range of meteorologists is between $5000 and $10,000 per year. Challenging opportunities exist for a few meteorologists to serve as consultants to industry. These consultants stand in a unique position of being some of the most active agents in expanding reliable uses of weather information and deserve encouragement by the entire profession. However, several limiting factors do exist which cause slow growth in this specialized field. *Subject Headings:* 1. **Careers in meteorology** 2. **Industrial meteorologists.**—*Author's abstract.*

12.4–90 551.5:631.36

Russell, J. A. (*Illinois Univ.*), **The transportation equipment industries.** *Meteorological Monographs*, (American Meteorological Society), Boston, 2(9):112–121, May 1957. 2 tables, 19 refs. **DWB, DLC**—A consideration of the effects of weather elements upon the manufacture of automobiles, aircraft, and locomotive and railway rolling stock. A detailed account is given of the effect of weather extremes upon plant layout, personnel and administration, upon specific plant operations such as foundry, forge shop, heat treatment machine shop, assembly; of the effect of weather elements upon tire manufacture, and upon the properties of aluminum, lead, tin, zinc, nickel and plastics. *Subject Headings:* 1. **Weather effects on transportation equipment production** 2. **Transportation industry.**—*I.L.D.*

12.4–91 551.586:697.97:728.98

Ash, Robert S. (*Int. Metal Products Co., Phoenix*), **Summer cooling for greenhouses.** *Air Conditioning, Heating and Ventilating*, N. Y., 54(8):65–69, Aug. 1957. 3 figs., table.

DLC—Evaporative cooling systems are recommended for greenhouses at places where excessive temperatures occur in summer. Temperatures can be lowered 15° to 30°F below outside temperature, whereas natural air circulation will only reduce temperature to 5°–15° above outside temperature. Design data are presented and discussed in relation to size of greenhouse and local climate, especially solar heat load. Examples are given and discussed and tables, charts and maps presented to show design, dry and wet bulb temperatures and average hourly solar radiation in BTU/sq ft for June 1955 for entire U. S., and diurnal variation in solar radiation and illumination on a horizontal surface (Phoenix, Ariz., September 1956), and the close relationship between the radiation intensity and the illumination. Effect of shade is emphasized. *Subject Headings:* **1. Greenhouse cooling system design 2. Design data for cooling systems 3. Solar radiation-illumination relationships.**—*M.R.*

12.4–92 551.524.37:551.586:628.8

*Hader, Fritz (*Vienna*), **Winterstrenge und Wärmeschutz.** [Severity of winters and heat conservation.] *Wetter und Leben*, Vienna, 9(10/12):147–150, **1957.** 3 tables. **DLC**—The author discusses the problem of economical housing construction in Vienna in relation to heat conservation in Vienna in the light of climate data on the severity of winters. The 30-year mean temperature of winter months in Vienna during the period 1775–1954 are compared with the 1901–1930 mean for Central Europe. The latter was characterized by unusually mild winters for Central Europe. In relation to earlier winters it seems that mild winters are a thing of the past so that a 45 cm thick wall would be a suitable heat conserving means. Data are presented on the frequency of specific winter severity in Vienna during a period of 100 years showing the number of times the mean monthly winter temperatures in Vienna corresponded to those in various localities in colder latitudes, the number of cold days in Vienna during the period 1775–1954 and the frequency of duration of sequential cold days in Vienna from the winter 1775–76 to the winter of 1954–55 (mean temperature −10°C and below). *Subject Headings:* **1. Severe winters 2. Heating of houses 3. Heating degree days 4. Vienna, Austria.** *-I.L.D.*

12.4–93 551.510.42

Gast, Th., **Hilfsmittel zur Messung und Registrierung von Staubfällen.** [Aids to measurement and recording of dust falls.] *Beiträge zur Physik der Atmosphäre, Frankfurt a.M.*, 30(2/3):128–136, **1958.** 5 figs., 35 refs. English and French summaries p. 128. **DWB, DLC**—The author gives an account of the work of the Commission on Atmospheric Pollutions, created in the autumn 1955 by the Union of German Engineers (VDI) after preparatory discussions with the Interparliamentary Study-Group. This Commission deals with all scientific and practical questions raised by the increasing pollution of the air by dust and waste gas. As far as possible all producers are to be included: industry as well as transportation on road and rail, medium and small trades and domestic fuel. The relation of discharge to deposition is also investigated, but not questions of radioactivity. The author wishes to promote cooperation between this Commission and the Special Committee on Radioactivity and refers to a publication including a plan of investigations, edited in November 1956 by the VDI. *Subject Headings:* **1. Atmospheric pollution control 2. Industrial pollutants.**—*Author's abstract.*

12.4–94 551.556.1:551.578.46:69

U. S. Agricultural Research Service, **Wind and snow loads on farm structures.** Its *ARS*-42-5, Oct. **1956.** 4 p. 2 figs., table. "The information abstracted from *U. S. National Bureau of Standards, Building Materials and Structures Report* 108, April **1948,** and from **Wind Loads on farm buildings,** pub. in *Agricultural Engineering*, Jan. **1947.**" **DWB** (M:690 U581w) Two generalized isarithm maps of the U. S. show: (1) maximum wind speed pressure in pounds per sq ft at a height of 30 ft and (2) the maximum snow load in pounds per sq ft. It is stated that values for any given location can be determined by interpolation (on the charts). The scarcity of data in rough or mountainous terrain would make this extremely dangerous (ed.). *Subject Headings:* **1. Wind and snow loads on buildings 2. Maximum wind force maps 3. Maximum snow load maps 4. United States.**—*M.R.*

12.4-95 551.501.5:551.571:69

Smith Harvey, **Relative humidity and equilibrium moisture content graphs and tables for use in kiln drying lumber.** *U. S. Forest Service. Forest Products Lab., Madison, Wisc., Report* R1651, Aug. **1947.** 4 p. 3 figs. **DWB** (M:69 U583re)—Kiln drying of lumber involves a working knowledge of qualitative, statistical and functional tables of values and these values can be presented graphically. The latter method shows the whole picture at a glance, as it shows the relationship between two or more variables. It reveals the maximum and minimum points, rates of change, and periodic changes that are frequently difficult to determine in large tables. Well-prepared graphs are valuable to a kiln operator and provide an excellent means of recording data. In this paper the relative humidity and equilibrium moisture content graphs and tables for use in kiln drying lumber are given. Methods of graphically finding the absolute humidity, the amount of water required to saturate air at a given temperature, the dew point or temperature at 100 percent relative humidity are discussed, to mention but a few. *Subject Headings:* **1. Relative humidity charts 2. Humidity diagrams 3. Lumber drying.**—*N.N.*

12.4-96 620.19:551.571:551.508.7:691

Steru, M., (*Inst. de Recherches Electroniques de Bucarest.*), **Le contrôle électrique de l'humidité des matériaux.** [Electrical checking of the moisture of materials.] *Mesures et contrôle industriel,* Paris, 23(258):865–871, Nov. **1958** and 23(259):957–962, Dec. **1958.** 22 figs., 11 refs. **DLC** -Measuring the moisture of materials is one of the important checking factors, the necessity of which is imperative. Moisture influences both the quality and quantity of materials. The author reviews the definitions of humidity and exposes the electric methods for measuring the moisture of materials: methods based on electric conductibility, methods using the change of permittivity and those based on dielectric losses. He deals successively with the connection between resistivity and humidity, the measurement conditions and the measurement outfit. *Subject Headings:* **1. Moisture content of materials 2. Moisture measurement instruments.**—*A.V.*

12.4-97 551.524:539.4:674

*Sulzberger, P. H., **Effect of temperature on the strength of wood, plywood and glued joints.** *Australia. Aeronautical Research Consultative Committee, Report* ACA-46, Dec. **1953.** 44 p. 31 figs., 11 tables, 20 refs., 12 eqs. **DWB**—A technical report based on tests made in the division of Forest Products of the C.S.I.R. at Melbourne from Dec. 1940 to Dec. 1946. All properties such as changes in strength, compression and elasticity are affected by temperature at some range of moisture content. Data presented in tables and charts are valuable for calculating effect of temperature on certain species such as spruce, pine, and 6 Australian woods over a wide range of temperature and humidity. ($-20°$ to $+90°C$, and at 8, 12 and 20% moisture content.) *Subject Headings:* **1. Temperature effects on strength of wood 2. Materials testing 3. Melbourne, Australia.**—*M.R.*

12.4-98 551.582.2(796)

*De Marrais, Gerard A., **Climatology of the National Reactor Testing Station.** *U. S. Atomic Energy Commissions,* [*Publication*] *IDO*-12003, June **1958.** 44 p. 13 figs., 14 tables. **DWB** (M82.2/796 U587cL)—This is the first in a series of three climatological reports on the National Reactor Testing Station (S.E. Idaho); those that follow will be the engineering climatology and diffusion climatology. This report is concerned with the general climatology of the area with particular emphasis on temperature, relative humidity, precipitation, snowfall, winds, pressure and special phenomena. The study is based on local observations made since 1950 and partially adjusted to climatic data (1921–1950) for Idaho Falls. The reasons for any significant variations in the observed meteorological parameters are discussed. *Subject Headings:* **1. Climate of National Reactor Testing Station, Idaho 2. Climatic data 3. Idaho.**—*Author's abstract and G.T.*

B8. FORESTRY

See: **Forest shelter belt effects on wind erosion** (Gruzdev), 12.4-326; **Forest effects on water resources** (Leyton, Green), 12.4-328.

C. ASTRONOMY AND ASTROPHYSICS

1. SOLAR PHYSICS

See also: **Radio emission from sunspots** (Korol'kov, Soboleva), 12.4–115; **Sunspot-scintillation relationships** (Koster, Wright), 12.4–116; **Solar corpuscular clouds** (Kraus, Crone), 12.4–117; **Solar radio brightness** (Swarup, Parthasarathy), 12.4–118; **Solar flare effects on cosmic rays** (Anderson), 12.4–123; **Solar cosmic rays** (Anderson, Enemar), 12.4–124; **Solar cosmic rays** (McCracken, Palmeira), 12.4–125; **Solar effects in F2 layer** (Appleton, Piggott), 12.4–140; **Coronal ray photometry** (Nikol'skiĭ), 12.4–245; **Solar radiation in the optical and meter-wave regions** (Oslo. Univ.), 12.4–246; **Velocity of solar corpuscles** (Petukhov), 12.4–247; **Solar corpuscular radiation** (Vsekhsviatskiĭ), 12.4–248; **Solar effects on temp. regime, U.S.S.R.** (Pokrovskaia), 12.4–250.

12.4–99 523.752

Haupt, H. (*Univ.-Sternwarte, Vienna*) and Ellerböck, W. (*Sonnenobservatorium Kanzelhöhe, Sattendorf*), **Der Protuberanzenaufstieg vom 11. April 1959, I, Beschreibung des Aufstiegs.** [The ascending prominence of April 11, 1959, Pt. 1, Description of the ascent.] *Zeitschrift für Astrophysik*, Berlin, 49(3):192–197, **1960.** fig., 3 photos, 3 refs. English summary p. 192. **DLC**—An ascending prominence was observed on April 11, 1959. It was followed with a Lyot filter of 0.75 Å band width and with another birefringent filter of 20 Å band width attached to the Kanzelhöhe coronograph. The development of the prominence and its motions were studied and a time-height-diagram was derived. *Subject Heading:* **1. Solar prominences.** —*Authors' abstract.* Ⓢ

12.4–100 551.521.64:523.75

Brown, R. R. and D'Arcy, R. G. (*Dept. of Physics, U. of Calif., Berkeley*), **Observations of solar flare radiation at high latitude during the period July 10–17, 1959.** *Physical Review Letters*, N. Y., 3(8):390–392, Oct. **1959.** 3 figs., 5 refs., eq. **DLC**—A paper reporting the observations made at balloon altitudes over College, Alaska, of the three cosmic ray intensity increases in association with solar flares of importance 3 which occurred on July 10, 14, and 16, 1959. The results reported here are mainly those obtained from the anticoincidence ring of counters. Three graphical representations illustrate in order the intensity versus atmospheric depth curve under quiet solar conditions, the observations obtained during one of the flare increases, and the counting rate of the ring of counters due to solar flare radiation at various atmospheric depths during the first flare outburst observed at College. *Subject Headings:* **1. Solar flare effects on cosmic rays 2. College, Alaska.**—*I.S.* Ⓢ

12.4–101 523.75:551.590.21

Andrews, Mary L. (*High Alt. Obs., Univ. of Colo.*), **Studies of solar flares and flare-associated terrestrial phenomena.** *American Geophysical Union, Transactions*, 40(2):177–181, June **1959.** 2 figs., 6 refs. **DWB, DLC**—A summary of studies of solar flares and flare-associated terrestrial phenomena that are in progress at the High Altitude Observatory, University of Colorado, Boulder. The studies briefly described are concerned with: physics of flares and related phenomena and solar terrestrial effects—radio wave absorption, cosmic noise absorption and magnetic variations. *Subject Headings:* **1. Solar flares 2 Solar-terrestrial relationships.**—*E.Z.S.* Ⓢ

12.4–102 551.521 67:551.511 33:551.510.53

†Ishikawa, G. (*Met. Res. Inst., Tokyo*), **Solar corpuscular radiation as a heat source of the upper atmosphere.** *Papers in Meteorology and Geophysics*, Tokyo, 10(2):93–123, Dec. **1959.** 13 figs., 4 tables, 30 refs., 58 eqs. English summary p. 93; Japanese summary p. 123. **DWB**—The heat production in the earth's atmosphere due to the collision between the air atoms and the solar corpuscular radiation is discussed. The fundamental processes are treated semi-classically to get approximate formulas for the quantitative discussion. The atmospheric model given by MILLER is employed to get the numerical values of the atmospheric elements. The intensity and the energy spectra of solar corpuscular radiation at the top of the atmosphere are estimated from the recent rocket measurements. About sixty per cent of the total energy

loss of primary radiation is transformed into thermal energy for the heating of the atmosphere. The vertical profile of the heating rate is sensitively affected by the energy spectra of the primary radiation. *Subject Headings:* **1. Solar corpuscular radiation 2. Heat sources of upper atmosphere.**—*Author's abstract.* Ⓢ

C2. MOON

12.4–103 550.34:523.3

Press, Frank (*Seismological Lab.*); Buwalda, Phyllis and Neugebaue , Marcia (*both, Calif. Inst. Tech., Pasadena*), **A lunar seismic experiment.** *Journal of Geophysical Research*, Wash., D. C., 65(10):3097–3105, Oct. **1960.** 5 figs., 3 tables, 12 refs., 9 eqs. **DLC** –A feasibility study shows that a lunar seismic experiment can provide significant data on the structure and composition of the moon. The presence or absence of lunar seismicity is an important clue to current tectonic processes that affect the lunar surface. In the first generation of experiments, single detectors are envisaged with the capability of recording body and surface waves. Investigation of proposed methods of lunar-seismogram interpretations indicates that these detectors should be sufficient to give a rough outline of lunar seismic geography and to indicate crudely the composition of the moon as well as its main structural features. In the absence of lunar seismicity, the best statistics on the frequency of meteorite impacts indicate that meteorites may provide useful auxiliary seismic sources. In reaching this conclusion, reasonable estimates were made of the efficiency of impact as well as of seismic-wave attenuation. Critical factors in the experiment are instrument lifetime and sensitivity and the nature of lunar microseismic noise. *Subject Headings:* **1. Moon 2. Seismic soundings on moon 3. Lunar seismicity.**—*Authors' abstract.* Ⓢ

12.4–104 523.3

Öpik, E. J. and Singer, S. F. (*both, Physics Dept., U. of Maryland*), **Escape of gases from the moon.** *Journal of Geophysical Research*, Wash., D. C., 65(10):3065–3070, Oct. **1960.** 4 tables, 12 refs., 12 eqs. **DLC** –Contrary to expectations from the classical theory of an exosphere, we find that even the heaviest gases, for example the noble gases krypton and xenon, cannot be retained by the moon. Because of the ionizing effects of solar ultraviolet radiation, electric forces now become more important than gravitational forces. First we consider thermal escape from a thick atmosphere with a hot top, and then from a thin atmosphere accommodated to the temperature of the surface, but still not an exosphere. We calculate also the rate of escape of photoelectrons and deduce the escape rate of ions. The lifetime of an atmosphere containing all the krypton and xenon believed to have evolved since the origin of the moon is of the order of 800 and 50 years, respectively. After the atmosphere has thinned to less than a mean-free path (i.e., an exosphere), yet another mechanism of escape of heavy gases exists. It seems likely that the moon as a whole is positively charged to a potential of about +20 volts, owing to the great intensity of solar ultraviolet radiation. Hence, in the vicinity of the moon there will exist a strong electrostatic field. Whenever a krypton or xenon atom is ionized while it is in flight within the screening length near the moon, the ion will be expelled by the electrostatic field. The lifetime turns out to be ~1000 years and is somewhat increased by the effect of solar corpuscular streams. Hence we conclude that there is not much likelihood that light or heavy gases evolving from the moon will be retained by the moon. The only gas in the vicinity of the Moon can come from interplanetary space itself. *Subject Headings:* **1. Lunar atmosphere 2. Ionization of gases.**—*Authors' abstract.* Ⓢ

12.4–105 535.24:523.34

Barabashov, N. P. and Chekirda, A. T. (*both, Kharkov Astron. Obs.*), **A study of the rocks most closely resembling the surface constituents of the moon.** *Soviet Astronomy AJ*, New York, 3(5):827–831, Mar./Apr. **1960.** 2 tables, 5 refs. Transl. of original Russian in *Astronomicheskiĭ Zhurnal*, Moscow, 36(5):851–855, Sept./Oct. **1959. DLC**—On the basis of photometric and spectrophotometric observations of rock species found on the earth and the moon, and on the basis of other characteristics, it is shown that disrupted volcanic tuffs correspond most closely to the lunar surface constituents. The authors used not two or three characteristics, as has been the practice up to the present, but a representative selection of characteristics, in performing the indication. The comparison was based on: (1) brightness

for integral light, (2) reflection coefficients for different regions of the spectrum, (3) the ligh reflection pattern, (4) smoothness factor, (5) energy distribution over the spectrum, (6) curve giving the variation of the degree of polarization as a function of the angle of incidence an angle of reflection of the light, and of phase angle, (7) thermal conductivity, and (8) density In addition, a comparison of the characteristics of lunar objects and terrestrial rocks wa performed, the surface of the rocks being: (1) irradiated by ultraviolet rays, (2) x-rays, (3) pro tons in a vacuum, (4) fused at atmospheric pressure, (5) fused in vacuo and, finally, (6) broke down into grains of various sizes and striated before and after fusion. The results of th comparisons showed that the lunar surface does not resemble a fused surface. The mos probable variant is that the surface of the moon is covered with disrupted tuffaceous rock, an in some places by coarse-grained volcanic ash. *Subject Headings:* **1. Moon's surface 2. Pho tometry of rocks.**—*Authors' abstract.* Ⓢ

C3. ECLIPSES

See also: **High frequency waves related to annular solar eclipse, April 19, 1958** (Kanayo, Ueno), 12.4–335.

12.4–106 551.506.7:523.78(52

*Kitaoka, Tatsumi, **Special upper air observations at solar eclipse on Sept. 12, 195** *Tateno, Japan. Aerological Observatory, Journal*, 6(4):Appendix, p. 111–171, Jan. **196** mostly tables. **DLC**—The results of upper air observations made on 12 Sept. 1950 at 11 upp air stations in Japan are tabulated. The data presented consists of radiosonde data and win aloft data. Values of pressure; temp., relative humidity, height, wind direction, wind spee and ascension rate are given. *Subject Headings:* **1. Solar eclipse observations 2. Upper a observations during eclipses 3. Japan.**—*I.S.* Ⓢ

12.4–107 550.385:523.7

Freier, G. D. (*Univ. Minnesota*), **The earth's electric field during an eclipse of the su** *Journal of Geophysical Research*, Wash., D. C., 65(10):3179–3181, Oct. **1960.** 3 figs., 5 ref **DLC**—The earth's electric field was measured during the total eclipse of the sun on Oct. 2, 195 and was found to show no change during this period. *Subject Headings:* **1. Earth's electri field 2. Solar eclipse effects on geoelectric field.**—*Author's abstract.* Ⓢ

12.4–108 551.594.12:551.510.535:541.1

Setty, C. S. G. K. (*Dept. Physics, Cent. Coll., Bangalore*), **Eclipse effects on the F1-laye observed at Cambridge on June 30, 1954.** *Journal of Atmospheric and Terrestrial Physic* London, 19(2):95–101, Oct. **1960.** 2 figs., 2 tables, 4 refs., 4 eqs. **DLC**—A study is mad of the solar eclipse effects on the F1 layer, observed at Cambridge on June 30, 1954, using th critical frequency data following the method developed by C. M. Minnis. The $h'(f)$ record were made during the period June 26 to July 5, 1954 using a panoramic ionosphere recorde Only a lower limit can be set for x the recombination coefficient in the F1 layer and a value o 8×10^{-9} is not unsuitable. The major part of the radiation causing the F1 layer ionizatio is almost uniformly distributed over the entire visible disc of the sun, except for some wea limb brightening to explain a discontinuity in the eclipse variation of the critical frequency a source of radiation 10% of the whole will have to be assumed to lie beyond the visible dis of the sun. *Subject Headings:* **1. Solar eclipse effects on F1 layer 2. F1 layer ionization.** *Author's abstract.* Ⓢ

C4. METEORS

12.4–109 551.507.362.2 551.590.25:523.5

Schubart, J., **Über die Möglichkeit natürlicher Erdsatelliten.** [Possibility of natura earth satellites.] *Die Sterne*, Leipzig, 35(11/12):229–232, Nov./Dec. **1959.**—Meteors ar small dust particles which describe a hyperbola when approaching the earth and which ente the earth's atmosphere with a velocity of at least 11 km/sec. As a result of various causes, e.g moon disturbances, collisions with other particles or disturbances in the earth's atmosphere the hyperbolic path can (temporarily) turn into a satellite trajectory before dipping. Th

meteors could also burn partially and leave the terrestrial atmosphere to become satellites. Observations however are not accurate enough. The author concludes that, owing to the temporary lessening of frictions, genuine meteorites moving with a velocity reaching only 8 km/sec can enter the lower earth's atmosphere. This would seldom happen, in view of the fact that the reported occurrences are questionable. *Subject Headings:* **1. Natural earth satellites 2. Satellite orbits 3. Meteor orbits.**—*A. V.* Ⓢ

12.4–110 523:532:523.851.4

Murakami, Tadayoshi (*Univ. of Hiroshima*), **On the structure of the Leonid stream.** *Astronomical Society of Japan, Tokyo, Publications*, 11(3):151–156, **1959.** 3 figs., 3 tables, 7 refs., 2 eqs. **DLC**—Visual observations of apparitions of the Leonid shower occurring in 1932 or thereabouts are profitably used to study the structure of the stream. The dense part of the stream is found to require about 6 years to pass a fixed point on the orbit. The density distribution decreases in an exponential function $f\Delta$ of the distance Δ from the central line of the orbit as given by $f\Delta = 40 \cdot \exp(-13\Delta^{0.62})$. The unstableness of the swarm may be seen from the occurrences in 1932. *Subject Headings:* **1. Leonid stream 2. Meteor showers.** —*Author's abstract.* Ⓢ

12.4–111 523.51

Chapman, D. R. (*Natl. Aeronautics and Space Administration, Ames Research Center, Moffett Field, Calif.*), **Recent re-entry research and the cosmic origin of tektites.** *Nature*, London, 188(4748):353–355, Oct. 29, **1960.** fig., 17 refs. **DWB**—An outline is given of some new results obtained by bringing to bear on the problem of the origin of tektites the recent advances made in the discipline of re-entry aerodynamics. It is concluded that the australite tektites show sufficiently clear and diverse indications of atmospheric entry to enable their initial velocity and flight path angle to be determined. A surprisingly narrow band of entry velocity is delineated which is in that part of the cosmic-origin range uniquely compatible with origin from the Moon. The various tektite groups are related by a family-like chemical composition and internal structure, hence it is presumed that the results will apply to all tektite groups. *Subject Headings:* **1. Tektite origin 2. Re-entry of tektites.**—*R.B.* Ⓢ

12.4–112 551.594.12:551.590.25

Weiss, A. A. (*C. S. I. R. O., Dept. Physics, U. Adelaide*), **Approximations for the electron density in meteor trails.** *Australian Journal of Physics*, Melbourne, 11(4):591–594, Dec. **1958.** fig., table, 6 refs., 6 eqs. **DWB, DLC**—Herlofsen's equations and his widely used approximations appear to apply to fast meteors but not to slow meteors. The author goes on to demonstrate more realistic description of conditions near the point of maximum electron density by his own improved sets of approximations, extent of which is shown in a table for comparison. *Subject Headings:* **1. Electron density of meteor trails 2. Meteor trails.** —*W.N.*

C5. RADIO ASTRONOMY

12.4–113 523.7:523.164.32

Coates, Robert J. (*U. S. Naval Res. Lab., Wash., D. C.*), **Millimeter and centimeter wavelength radiation from quiet and active solar regions.** *National Electronics Conference, Chicago, Oct. 1957, Proceedings*, Vol. 13:353–364, pub. **1957.** 16 figs. (incl. photos). **DWB** (621.38 N277pr)—The characteristics of the quiet sun (methods of investigation of the solar chromosphere, eclipse receivers, radio telescopes, etc.) and the active sun, and plans for IGY to learn more about solar effects on radio propagation at very high frequencies, is reviewed with photographs and records included to illustrate effects already observed. *Subject Headings:* **1. Solar radio radiation 2. Solar effects on radio wave propagation.**—*M.R.*

12.4–114 523.164.3/4:629.396.677

Horner, F., **Extra-terrestrial radio noise as a source of interference in the frequency range 30–1000 Mc/s.** *Institution of Electrical Engineers, London, Proceedings, Pt. B*, 107(34): 373–376, July **1960.** 2 figs., 11 refs. **DLC**—Published information on the intensity of noise from the galaxy, the sun and from other extra-terrestrial sources is presented in a form which

shows their importance relative to the internal noise of typical receiving installations. Pa ticular attention is paid to a half-wave horizontal dipole aerial and to an aerial with a 2(pencil beam directed horizontally. *Subject Headings:* **1. Galactic radio noise 2. Rad interference.**—*Author's abstract.* Ⓢ

12.4–115 523.164.32 :621.396.8 :523.74

Korol'kov, D. V. and Soboleva, N. S., **Novoe o radioizluchenii solnechnykh piaten.** [Ne information on radio emission from sunspots.] *Priroda*, Moscow, No. 1 :87–89, Jan. **195** 3 figs., 2 refs. **DLC.** Transl. into English by E. R. Hope issued as *Canada. Defence R search Board, Translation* 286 R, April 1958. figs., etc. **DWB**—The authors discuss briefl the magnetic properties of sunspots, measurements of magnetic fields by the Zeeman effec the transparency of the solar atmosphere to different radio wave lengths and the use of th polarization of sunspot radio emission as an index of the solar field at different heights in th solar atmosphere. The operating principle of the equipment used at the Main Astronomic Observatory at Pulkovo to observe polarization of sunspot radio emission on a wave length 3 cm is described, with the aid of diagrams. It is based upon the use of a polarization modul tor, which makes it possible to eliminate the non-polarized background of the source emissio The results of observations made during the partial solar eclipse of Dec. 2, 1956 showing th variation of a circularly polarized signal, the eclipse phase, the trajectory of the moon's cent and the sudden change in the intensity of the polarization signal are presented. The effecti temperature of the polarized radiation is computed as 400,000 degrees. This high temperatu is explained by supposing that in the regions corresponding to the emission there exist co densations with a temperature around 5×10^6 degrees and a strong magnetic field. The may be the coronal radiations which are sometimes observed in a sunspot area. *Subje Headings:* **1. Sunspot radio radiation 2. Sunspots and magnetic storms 3. Radio emissio from sun.**—*I.L.D.*

12.4–116 523.164.42 :550.385 :523.74

Koster, J. R. and Wright, R. W. (*both, Univ. College of Ghana*), **Scintillation, Spread F and transequatorial scatter.** *Journal of Geophysical Research*, Wash., D. C., 65 (8) :2303–230 Aug. **1960.** 3 figs., 5 refs. **DLC**—Radio star scintillations of great intensity are a comm occurrence at the equator. Near the minimum of sunspot activity they exhibit little d pendence on magnetic activity, but as sunspot maximum approaches there is marked negati correlation between the occurrence of scintillation and the degree of magnetic disturban Radio star scintillation is found to be much greater at sunspot maximum than at sunsp minimum. *Subject Headings:* **1. Radio star scintillation 2. Sunspot-scintillation relationship 3. Spread F.**—*Authors' abstract.* Ⓢ

12.4–117 523.164.3

Kraus, John D. and Crone, W. Reed (*both, Radio Obs., Ohio State Univ.*), **Apparent ob servations of solar corpuscular clouds by direct continuous-wave reflexion.** *Nature*, Londo 184 (4691) :965–966, Sept. 26, **1959.** 2 figs., 5 refs. **DWB**—A paper reporting the details several unique Doppler signals recorded at the Ohio State University Radio Observatory o the morning of April 15, 1959. It is held that the signals may possibly be due to the reflectio of continuous wave signals from fast moving solar corpuscular clouds passing in the vicinit of the Earth. Instrumental details of the receiver and particulars of recordings are give Two photographs of swept frequency record of Doppler signals at different times are show A large solar flare which occurred on April 13, and a number of terrestrial phenomena occurri on April 15 are noted as suggestive of Doppler reflections from solar corpuscular cloud *Subject Headings:* **1. Radio astronomy of sun 2. Solar flares 3. Solar corpuscular clouds.**— *Authors' abstract.* Ⓢ

12.4–118 523.164.32 :621.396.

Swarup, G. and Parthasarathy, R., (both, *Div. of Radiophysics, C. S. I. R. O., Uni Grounds, Chippendale*), **Solar brightness distribution at a wavelength of 60 centimetres, Pt. 2 Localized radio bright regions.** *Australian Journal of Physics*, Melbourne, 11 (3) :338–34 Sept. **1958.** 4 figs., 3 tables, 17 refs. (For Pt. 1, *see* 9A–95, Jan. 1958, *Met. Abs.*) **DLC**

The localized radio bright regions on the Sun which give rise to a slowly varying component of the solar radiation were studied at a wavelength of 60 cm, using a 32-aerial interferometer with a beamwidth of 8.7 min of arc. The observations were undertaken during July 1954 to March 1955 and were limited in number due to this being a minimum period of the solar cycle. The low activity, however, provided the advantage of simple interpretation as often only one region was present on the solar disk. The characteristics of the observed bright regions are described; their occurrence is closely correlated with regions of chromospheric faculae, the emission polar diagram has a half-power width of 6 days, the estimated size of the sources varied from less than 3 to 6 min of arc, the largest value of the derived brightness temperature was 10^7 °K, and for two groups of localized regions the height of the source was derived to be $35{,}000 \pm 15{,}000$ km above the photosphere. Sometimes the slowly varying component showed marked intensity fluctuations in periods of nearly half an hour. The presence of apparently associated fluctuations suggests that at least a part of the slowly varying component at 60 cm has a non-thermal origin. *Subject Heading:* **1. Solar radio brightness.**—*Authors' abstract.*

D. OUTER ATMOSPHERE

1. COSMIC RADIATION

See also: **Mechta radiation data** (Vernov et al.), 12.4-56; **Radiation measurement by second space rocket** (Vernov et al.), 12.4–57; **Solar flare effects on cosmic rays** (Brown, D'Arcy), 12.4–100.

12.4–119 551.521.64(09)

Die Entdeckung der Kosmischen Strahlung in Wien 1911–1912. [Discovery of cosmic radiation in Vienna, 1911–1912.] *Wetter und Leben*, Vienna, 11(11/12):174, **1959.** photo, 2 refs. **DWB**—A picture of the balloon used and notations of the altitudes reached. A note referring to award given V. F. Hess for discovering cosmic rays. *Subject Headings:* **1. Cosmic ray discovery 2. Hess, V. F.**—*E.Z.S.* Ⓢ

12.4–120 551.521.64:061.3(473)

Zhdanov, G. B., **Novye dannye o kosmicheskom izluchenii.** [New data on cosmic radiation.] *Priroda*, Moscow, No. 11:71–74, Nov. **1959.** fig., 3 foot-refs. **DLC**—The author summarizes some of the data presented at the Seventh International Conference on Cosmic Physics (organized by the Commission of Cosmic Rays of the International Geophysical Union and of Applied Physics) held in Moscow in June 1959. Powell reported on experiments of irradiating (on airplanes) 10 liter containers of photographic emulsion in order to observe the nuclear interaction proceeding under energies of 10^{15} ev. I. L. Grigorov described an apparatus for studying on high mountains the interaction of cosmic rays with matter at energies of 10^{14} ev. It involves the use of an ionization chamber to measure the entire energy expended on the ionization of atoms of matter by all particles of the initial nuclear interaction—along the entire length of the path of these particles in dense filters of the apparatus. Rossi (U. S.), G. T. Zatsepin (U.S.S.R.), etc. reported that with the same energy of interactions of cosmic ray particles the interactions in different cases may differ in number, energy and in the particles produced. The Van Allen belt or belt of high radiation intensity is described briefly. Also papers were presented on the constitution, intensity, variation and origin of the "common" cosmic radiation, in particular on the relationship between primary cosmic radiation and solar activity, etc. *Subject Headings:* **1. Cosmic ray conferences 2. Moscow, U.S.S.R.**—*I.L.D.* Ⓢ

12.4–121 523.165:523.74

Duke, P. J. (*H. H. Wills Physics Lab., Univ. of Bristol*), **The variation with time of the flux and energy spectrum of primary cosmic ray alpha particles.** *Philosophical Magazine*, London, 5(59):1151–1159, Nov. **1960.** 4 figs., 17 refs., 3 eqs. **DWB, DLC** (Q1.P5)—The total flux and energy spectrum of primary cosmic-ray alpha particles at the top of the atmosphere have been measured in emulsion stacks flown during September 1956 and June 1958.

Values of 240±26 and 130±15 particles/m² steradian second respectively were obtaine for the total flux. This reduction in the flux during June 1958 was caused by the parti removal of those alpha particles with energies between 100 and 2000 Mev/nucleon. The changes have been correlated with the 11-year cycle of solar activity. *Subject Heading* **1. Cosmic ray alpha particles 2. Solar cycle.**—*Author's abstracts.* Ⓢ

12.4–122 551.521.64:535.24

†Waldeskog, B. and Mathiesen, O., **Photometric charge determination of relativistic hea primaries in cosmic radiation.** *Arkiv för Fysik*, Stockholm, 17(25):427–440, 1960. 7 figs 6 tables, 46 refs., eqs. **DWB** —A photometric method of determining the charge of relativist heavy primary particles in photographic emulsions is described. Corrections for differe emulsion effects are applied. The accuracy of the charge determination in the interv $3 \leqslant Z \leqslant 14$ is very good. The standard error corresponds to about one fifth of the distan between consecutive charges. The method may also be used for higher charges. The charg spectrum is studied in the interval $3 \leqslant Z \leqslant 14$ in emulsions flown over Texas at 41° geomagnet latitude. The mean flight altitude was about 29 km corresponding to 14 g/cm² overlyir atmosphere. The charge calibration is made by δ-ray counting and by studies of fragmentati of heavy nuclei in the emulsion. An extrapolation of the number of boron particles to t top of the atmosphere shows that there exists a finite flux of these particles in the primar beam. The abundance ratio N_{Boron}/N_M falls in the interval 0.13 to 0.25, depending on t fragmentation probabilities used for extrapolation. The results further show that the relati frequency of nitrogen nuclei is small compared with the frequency of carbon and oxygen nucl These nuclei occur in comparable amounts. *Subject Headings:* **1. Primary cosmic ray i tensities 2. Cosmic ray nucleon distribution 3. Heavy nuclei in cosmic radiation 4. Ph tometry of cosmic rays 5. Chemical composition of cosmic rays 6. Texas.**—*Authors' a stract.* Ⓢ

12.4–123 551.507.3:523.75:551.521.

Anderson, Kinsey A., **Solar particles and cosmic rays.** *Scientific American*, N. Y 202(6):64–71, June 1960. 8 figs. **DWB, DLC**—Recent results of studies at the Universi of Minnesota on the magnetic fields in the galaxy as an accelerator for cosmic rays are presente investigating the possibility of injection of particles from the sun and similar stars into it. T solar flare was the most likely mechanism to push the cosmic rays up to their immense energi in this "galactic accelerator" contemplated by Enrico Fermi. The continued study flares, observed during IGY by ground instruments, high-altitude balloons and artificial studie as operating 15% of the time to eject particles with energies of almost 500 million electr volts served for tentative conclusions about the role of the sun as a source of embryonic cosm rays. The IGY solar flare investigations, actually already begun Feb. 23, 1956, resulted the conclusion that the starts injecting particles as infrequently as the sun would not supp enough to account for the observed number of cosmic rays. Investigators in northern regio found protons with an average energy of at least 10 million electron volts entering the a mosphere after many large flares. Balloons launched in August, 1958 at Fort Churchi Canada detected an increase in radiation 75 min. after a large sun flare. Data for the sa time from satellite Explorer IV showed solar particles of less than 100 million electron volt 300 miles up, about 100 times as numerous as those at balloon level. A balloon launched ne Minneapolis at the same time did not record neutrons. The radio-noise outbursts followi a flare indicate a magnetic field to trap electrons about the sunspot region. Investigatio of solar flares with riometers, balloons and satellites have produced relations between sol protons and ionospheric opacity. Even if the solar atmosphere contained many undetect alpha particles their energy would be insufficient to penetrate to balloons 20 mi above the ear It seems that the sun could not be a source of embryonic cosmic ray particles. This sugges super-novae originating the cosmic rays, expelling a large number of alpha particles from the helium-rich interiors when exploding. Earth's lines of magnetic force, the great solar fla of July 16, 1959, emission and energy flare of particles, ionosphere over Far North, radio-noi from the galaxy and solar protons are illustrated. *Subject Headings:* **1. Solar flare effects c cosmic rays 2. High altitude balloons 3. Cosmic ray intensities 4. Cosmic ray ballo research.**—*O.T.* Ⓢ

12.4–124 551.521.64:550.385.4

Anderson, Kinsey A. and Enemar, D. C. (*both, State Univ. of Iowa*), **Observations of solar cosmic rays near the north magnetic pole.** *Journal of Geophysical Research*, Wash., D. C., 65(9):2657–2671, Sept. 1960. 7 figs., 21 refs. **DLC**—Following a large solar flare on July 16, 1959, fluxes of protons in the energy region 85–300 Mev in a steep spectral distribution were observed by means of high altitude balloons over Resolute Bay, Canada. The flare particle intensity decreased rapidly and quite steadily over a period of several days, but on the occasion of the last flight, launched on July 27, a small flux remained above the high energy cosmic ray level. At that time the active region in which the flare occurred was nearly opposite central meridian. The time dependence of the particle intensity followed quite well a t^{-3} law for which $t=0$ about 16 hrs after the flare. This low energy cosmic ray-producing flare was accompanied by large and complex radio noise emission, and the particles produced the usual terrestrial effects of long lasting Polar cap radio blackout, including large riometer effects. During the magnetic storm, at the time the particles were being admitted at forbidden geomagnetic latitudes to the south, the particle intensity was undisturbed over Resolute Bay. *Subject Headings:* **1. Solar cosmic rays 2. Resolute Bay, Canada.** *—Authors' abstract.* Ⓢ

12.4–125 551.521.64:523.75

McCracken, K. G. and Palmeira, R. A. R. (*both, M. I. T.*), **Comparison of solar cosmic rays injection including July 17, 1959 and May 4, 1960.** *Journal of Geophysical Research*, Wash., D. C., 65(9):2673–2683, Sept. 1960. 10 figs., 2 tables, 24 refs. **DLC**—Using neutron monitor data obtained at high latitudes, it is shown in Pt. 1 that cosmic ray particles of rigidity >1 bv were produced by the solar flare that occurred at 2115 UT on July 16, 1959. The exponent of the integral rigidity spectrum of the radiation was $\leqslant -8.0$. The temporal dependence of the flare radiation was unlike that of earlier flare effects, the intensity requiring ~7 hrs to reach its maximum value. No impact zones were observed. In Pt. 2, meson data obtained at the time of the flare effect starting at 1031 UT on May 4, 1960, are presented. In Pt. 3, by considering the above-mentioned flare effects, and those observed previously, it is shown that the time scale of the cosmic ray flare effect is a highly variable quantity, varying by a factor as great as 36 from event to event. The flares responsible for the four flare effects with the shortest time scales occurred on the western solar limb; those resulting in the flare effects with the longest time scales occurred near the center of the solar disk. In Pt. 4, the above facts are shown to support the theoretical model proposed by PIDDINGTON. *Subject Headings:* **1. Solar flares 2. Solar cosmic rays.**—*Authors' abstract.* Ⓢ

12.4–126 551.521.64

Kellogg, Paul J. (*Univ. Minnesota*), **Calculations of cosmic-ray trajectories near the equator.** *Journal of Geophysical Research*, Wash., D. C., 65(9):2701–2703, Sept. 1960. 4 figs., 2 tables, 3 refs. **DLC**—New calculations of cutoff rigidities near the equator have been carried out on a fast electronic computer, using the 48-parameter expression for the earth's magnetic field. The results are in good accord with observations. *Subject Heading:* **1. Cosmic ray trajectories.**—*Author's abstract.* Ⓢ

D2. IONOSPHERE

See also: **Physics of upper atmos.** (Ratcliffe, *ed.*), 12.4–1; **Ionos. stations, Antarctica** (Panzarini), 12.4–23; **Measurement of ion composition by third satellite** (Istomin), 12.4–55; **Solar eclipse effects on F1 layer** (Setty), 12.4–108; **Hydromagnetic propagation of sudden commencements** (Francis et al.), 12.4–147; **Ionos.-magnetic relationships** (Onwumechilli), 12.4–150.

12.4–127 551.510.535:551.510.62:621.396.8

Bailey, D. K., **Scattering at oblique incidence from ionospheric irregularities [Summary of an informal talk].** (In: Physical Society of London, **Physics of the ionosphere.** London, **1955.** p. 99–100. 3 refs.) **DWB**—Waves of detectable power can be transmitted from a sender of power about 30 kW over distances ~1200 km on frequencies ~50 Mc/s by forward scattering from ionospheric irregularities estimated to occur at a height of 75–80 km by day

and 85–90 km by night. The scattered wave undergoes fading, shows regular diurnal and seasonal variations and varies during geomagnetic storms. The received power has been related to the frequency of transmission and to the plasma frequency of the ionization in which the scattering irregularities are embedded. *Subject Headings:* **1. Ionospheric irregularities 2. Ionospheric radio wave scattering.**—*Physics Abstracts, No. 8421, 1955.*

12.4–128 537.56:532.59

Argence, E., **Propagation d'une onde plane dans un milieu ionisé anisotrope transparent et propagation dans un milieu ionisé hétérogène.** [Propagation of a plane wave in an anisotropic transparent medium and propagation in a heterogeneous ionized medium.] (In: Physical Society of London, **Physics of the ionosphere.** London, **1955.** p. 288–298. fig., table, 14 refs., 20 eqs.) **DWB**—Mathematical treatment. The method gives directly the differential equations for the paths of phase and energy. Results are given for the lateral displacement of ordinary and extraordinary rays at certain stations, which combined with experimental critical frequency data allow estimation of the horizontal gradient of ionization. Applications to the cases of normal incidence and propagation along the magnetic equator are considered. Propagation in a heterogeneous layer is considered in the absence of a magnetic field. *Subject Headings:* **1. Plane wave propagation 2. Physics of the ionosphere.**—*Physics Abstract, No. 8943, 1955.*

12.4–129 551.594.12:551.510.535:551.510.62:621.396.1

Jackson, J. E., **Effect of oblique propagation paths upon the NRL rocket studies of the ionosphere.** *U. S. Naval Research Laboratory, NRL Report 4960*; July 23, **1957.** 15 p. 7 figs., 3 tables, 7 refs. (*Upper Atmosphere Research Report*, No. 29.) **DWB** (M11 U58u)—Results of ten years of vertical propagation tests from signals emitted by rockets are reviewed and the anomalous conditions discovered when paths were inadvertently oblique, discussed in detail. Effects due to the earth's magnetic field, to reflected rays and rocket roll are considered for the vertical case and effects due to bending of rays considered for the oblique case, as exemplified by the flight of Aerobee-Hi-NRL-50. The corrections for electron densities as calculated from this oblique case are also treated. These corrections are 1) for changing electron density along successive propagation paths and 2) variation in angle between propagation path and geomagnetic field (near peak of path). *Subject Headings:* **1. Electron density measurement 2. Ionospheric radio wave propagation.**—*M.R.*

12.4–130 551.510.535:551.594.12

Pineo, V. C.; Kraft, L. G. and Briscoe, H. W. (*all, Mass. Inst. Tech.*), **Some characteristics of ionospheric backscatter observed at 440 Mc/s.** *Journal of Geophysical Research*, Wash., D. C., 65(9):2629–2633, Sept. **1960.** 7 figs., 4 refs., eq. **DLC**—Incoherent ionospherically backscattered radar returns have been observed at 440 Mc/s over an approximate height range of 100–800 km. The results of experiments designed to determine the variation with height of both the intensity and the frequency spectrum of backscattered returns are presented. Backscatter signal-intensity measurements at radio frequencies much greater than the F2 critical frequency provide an independent means of estimating electron densities. Height profiles of electron densities obtained from experimental data are discussed. Experimentally determined values of the scattering cross section are approximately equal to the square of the classical electron radius. A typical result of the frequency spectrum measurements at 440 Mc/s indicates a half-power spectrum width of about 11 kc/s at a height of about 300 km during mid-afternoon of a March day. Spectrum widths observed at several heights and at various times of day and night are discussed. *Subject Headings:* **1. Ionospheric electron density measurement techniques 2. Ionospheric electron density calculations 3. Ionospheric scattering** —*Authors' abstract.* Ⓢ

12.4–131 551.594.13:551.510.535:551.551.5:550.38

Howells, I. D. (*Trinity College, Cambridge*), **The effect of turbulence and magnetic field on electron density fluctuations in the ionosphere.** *Journal of Fluid Mechanics*, London, 8(4):545–564, Aug. **1960.** 2 figs., 9 refs., eqs. **DWB, DLC**—Dungey (1956) has shown that the number densities of electrons and positive ions, under the action of turbulence and the

magnetic field in the ionosphere, are closely equal—in other words the only fluctuations in electron density are those controlled electrostatically by the ions—and he has estimated the magnitude of the fluctuations. The present paper uses Dungey's model and results, reduces his equations to a single equation for electron density, in each of several cases, and then investigates the possible spectra of fluctuations. It is concluded that, in the circumstances that commonly arise, the spectrum on this model should be nearly isotropic, though exceptionally there could be a strong elongation of irregularities at right angles to the magnetic field. Thus some other mechanism is required to account for the elongation that is observed, parallel to the field. Below 110 km, where the magnetic effect on the ions' motion is small, and at wave-numbers in the inertial subrange of the turbulence, dimensional argument shows that the spectrum function (integrated over all directions) is proportional partly to k^{-1} and partly to $k^{-5/3}$. Above 120 km the magnetic effect is large; a more detailed study shows that when turbulence is present, which probably is not often, the spectrum function in the inertial subrange is proportional to k^{1}, with considerable anisotropy. *Subject Headings:* **1. Ionospheric electron density variation 2. Magnetic field effects on ionospheric density 3. Turbulence effects on ionospheric density.**—*Author's abstract.* Ⓢ

12.4–132 551.557:551.510.535

Checha, V. A. and Zelenkov, V. Ie., **Drifts of irregularities in the ionosphere according to observations of the Tomsk Ionospheric Station.** *U. S. National Aeronautics and Space Administration, Technical Translation* F-20, June 1960. p. 70–83. 9 figs., 12 refs., 4 eqs. (Transl. of original Russian in a collection of articles issued by the Akademiia Nauk SSSR. Mezhduvedomstvennyĭ Komitet po Provedeniiu MGG, Moscow, 1959.)—The main characteristics are given of the equipment used for the closely spaced receivers. The results of observations carried out during 8 months are represented for every month by histograms, roses of winds, diurnal and semidiurnal components of velocity of the solar origin. The influence of lunar tidal oscillations in the E region is noted. The character of the drift of ionospheric irregularities is essentially different for the different heights. Moreover, the positive velocity gradient with the height is observed. The dependence of magnitude of velocity on the magnetical K-figure has been measured. The part of the data, prepared by means of the correlation method, allowed to determine the mean velocity of irregular movements of the inhomogeneities. The increasing of velocity of irregular movements with height is noted. The sizes are measured of the small-scale inhomogeneities, which are usually larger in E region than those in F2 region. A short description is given of the correlator for extraction of the information from experimental data. *Subject Headings:* **1. Ionospheric drift 2. Tomsk, Tomsk Region, U.S.S.R.**—*Authors' abstract.* Ⓢ

12.4–133 551.501.7:551.557:551.510.535

Erofeev, N. M.; Dzhemilev, G. G. and Perelygin, V. P. et al., **Original results of radiotechnical observations of the movement of irregularities in the ionosphere (winds) over Ashkhabad at altitudes of 200–300 km.** *U. S. National Aeronautics and Space Administration, Technical Translation F-20,* June 1960. p. 45–53. 2 figs., 3 tables, 10 refs. (Transl. of original Russian in a collection of articles issued by the Akademiia Nauk SSSR. Mezhduvedomstvennyĭ Komitet po Provedeniiu MGG, Moscow, 1959.)—This paper describes observations of drift of the ionospheric irregularities in the layer over Ashkhabad ($\varphi = 37°55'$; $\lambda = 58°18'$) between Jan. 1 and June 30, 1958. The method of spread reception with short base is taken as the basis of observations. Brief characteristics are given of the equipment, methods of measurements, and processing of results. The results of observations are given monthly and for the whole period. *Subject Headings:* **1. Ionospheric drift measurement techniques 2. Ashkhabad, Turkmen S.S.R. I. Petinov, V. P.** —*Authors' abstract.* Ⓢ

12.4–134 551.510.535:551.510.62:621.396.8

Schrag, R. L., **M-type ionospheric reflections at 150 kc/s.** (In: Physical Society of London, **Physics of the ionosphere.** London, 1955. p. 78–87. 11 figs., 2 tables, 6 refs. **DWB** (M10.535 C748)—This paper is devoted to the description and interpretation of occasional observations of extraordinarily polarized echo 'trains' during vertically incident radio sounding experiments, using 150 kc/s pulsed signals. These echo 'trains' in addition to their

unique polarizations, had low amplitudes, compared with the normal E-region echoes observed simultaneously, and exhibited unusually low successive-hop absorption. The phenomenon was detected in the course of night-time ionospheric recording employing extended-range receiving instrumentation (SCHRAG, **1954**). The experimental observations were found to be consistent with a highly efficient M-type reflection mechanism, utilizing X-mode reflectors at approximately 120 and 230 km. According to this interpretation, a rather deep ionization 'well' must have existed between regions E and F of the ionosphere. Information is also obtained concerning certain low-frequency properties of sporadic E and the state of polarization of received 150 kc/s signals which had pure X-mode polarizations above 100 km. *Subject Headings:* **1. Ionospheric radio wave reflection 2. Ionospheric echoes 3. E region.**—*Author's abstract.*

12.4–135 551.510.535:551.510.62:621.396.1

Phillips, G. J., **Diffuse ionospheric reflection of medium waves at night.** (In: Physical Society of London, **Physics of the ionosphere.** London, **1955.** p. 174–180. 4 figs., 2 refs., eq.) **DWB** (M10.535 C748)—Observations are described of the range of angle about the mean angle of arrival over which the main energy of a downcoming ionospheric wave is spread. A medium-wave broadcasting station was received on two loop aerials spaced about one-quarter wave length in the direction of the transmitter, each loop being oriented to reject the ground wave. The reflection was from E layer at moderately oblique incidence. Since the base line was too short to obtain results from amplitude difference for the two aerials, continuous records were made of (i) the phase indifference, (ii) the magnitude of the vector difference in radio-frequency amplitude, and (iii) the amplitude at one aerial. In evaluating the results, the downcoming radiation was treated as if confined to a vertical plane containing the transmitting and receiving aerials, and the power per unit range of angle at a given angle θ to the vertical was assumed to be maximum at the mean angle of arrival θ_m and to fall off on either side according to a gaussian distribution $\exp\{-(\theta-\theta_m)^2/2\theta_0^2\}$, θ_0 being a parameter determining the amount of diffusion. Values of θ_0 for Paris I (863 kc/s) received in April 1953 at Kingswood, Surrey, averaged about 8° in the early evening, increasing to somewhat higher values towards midnight. This increase may, however, have been due to multiple reflection. The mean angle of arrival over hourly periods remained fairly close to the value expected for a simple E reflection (about 58°). *Subject Heading:* **1. Ionospheric radio wave reflection.**—*Author's abstract.*

12.4–136 551.501.42:551.510.535:551.510.62

Shinn, D. H., **Tables of group refractive index for the ordinary ray in the ionosphere.** (In: Physical Society of London, Physics of the ionosphere. London, **1955.** p. 402–406. 2 tables, eqs. **DWB** (M10.535 C748)—For various theoretical calculations connected with $h'(f)$ observations it is necessary to know μ', the 'group refractive index' of the ionosphere. This is defined as the free space velocity of light divided by the vertical component of the group velocity of the wave. This definition is valid for both vertical and oblique incidence. The tables represented here refer only to vertical incidence. In this case μ' is a function of X, Y, and ϕ, where X is proportional to (electron density)/f^2, Y is equal to (gyromagnetic frequency)/f, and ϕ is the angle of dip of the earth's magnetic field. It is convenient to define $t=(1-X)^{\frac{1}{2}}$, and to tabulate $\mu' t$ against t. Tables are presented covering values of t from 0 to 1, of Y from 1/8 to 1, and of ϕ from 0° to nearly 80°. Methods of using the tables are discussed. Absorption due to electronic collisions is neglected throughout. *Subject Heading:* **1. Refractive index tables.**—*Author's abstract.*

12.4–137 551.510.535:551.510.62:621.396.8

Allcock, G. McK., **Ionospheric absorption at low and medium frequencies.** (In: Physical Society of London, **Physics of the ionosphere.** London, **1955.** p. 14–19. 4 figs., 10 refs., 8 eq.) **DWB** (M10.535 C748)—This paper describes a preliminary analysis of the combined results of measurements by many workers of ionospheric absorption of radio waves of frequencies from 16 kc/s to a few Mc/s. It is shown that oblique-incidence results at a frequency f can be simply related to vertical-incidence results in terms of an equivalent vertical frequency $f\cos i$, where i is the angle of incidence of the oblique-incidence waves on the ionosphere. In

this way a first-order approximation to the variation of absorption with frequency and distance has been obtained. *Subject Heading:* **1. Ionospheric absorption of radio waves.**—*Author's abstract.*

12.4–138 551.510.535:551.510.62:621.396.1

Fejer, J. A. (*Defence Res. Board, Ottawa*), **Radio-wave scattering by an ionized gas in thermal equilibrium.** *Journal of Geophysical Research*, Wash., D. C., 65(9):2635–2636, Sept. **1960.** 5 refs., 4 eqs. Summary only. **DLC**—Expressions for the power density and the power spectrum of radio waves scattered by the density fluctuations of an ionized gas in thermal equilibrium are presented. These expressions are applicable to the terrestrial ionosphere and are in agreement with results obtained by an UHF radar. *Subject Headings:* **1. Ionospheric scattering 2. Radio wave scattering.**—*Author's abstract.* Ⓢ

12.4–139 551.510.535:551.510.62:621.396.1

Booker, H. G.; Nichols, B. et al., **Studies on propagation in the ionosphere.** *Cornell Univ. School of Electrical Engineering*, Contract DA36-039-sc-74903 Quarterly Progress Report, No. 1, Dec. 31, **1957.** 19 p. illus. (Original unchecked) (ASTIA AD-158-856)—The advent of satellites has made possible the determination of the height of scintillation by measurements made of radiation from a CW source at various levels in the F region. A new attempt to explain spread F, based on the idea of columns of ionization along the earth's magnetic fields, has been made. *Subject Headings:* **1. Ionospheric radio wave propagation 2. Spread F 3. Satellite ionospheric observations.**—*TAB abstract.*

12.4–140 551.594.12:551.510.535:523.746

Appleton, Sir Edward and Piggott, W. R., **Storm phenomena and the solar cycle variations of the F2 layer ionization at noon** (In: Physical Society of London, **Physics of the ionosphere.** London, **1955.** p. 219–228. 6 figs., 3 tables, 7 refs., 8 eq.) **DWB** (M10.535 C748)—The sensitivity of the F2 layer to changes in solar activity varies greatly with position and season, suggesting that it is influenced by changes in the atmosphere. Comparisons between the values of foF2 near noon for magnetically quiet and disturbed days, and for monthly averages over two solar cycles, show characteristic perturbations with seasonal variations similar to those of ionospheric storms. Differences in the incidence of magnetic storminess in the rising and falling parts of the solar cycle appear to be sufficient to account for the observed multiple values of foF2 at constant sunspot number. The latter is, however, a poor index of the incidence of photoionizing radiation during any one month. *Subject Headings:* **1. Storm phenomena 2. F2 layer ionization 3. Solar cycle variations of F2 ionization 4. Physics of the ionosphere.**—*Authors' abstract.*

12.4–141 551.510.535:551.594.12

Appleton, Sir Edward and Lyon, A. J., **Ionospheric layer formation under quasi-stationary conditions.** (In: Physical Society of London, **Physics of the ionosphere.** London, **1955.** p. 20–39. 4 figs., 8 refs., 115 eqs.) **DWB** (M10.535 C748)—A modified theory of ionospheric layer formation is described in which the value of the spatial maximum of electron density N_m and its atmospheric height $z(N_m)$ are given explicitly. The work owes much to Chapman's classical treatment of the theory of ionospheric layer formation, but yields results which are more directly applicable to the type of problems encountered in practice. It may be used, for example, in cases where the atmospheric properties, such as temperature and recombination coefficient, vary with height, or where the layer is distorted by atmospheric tides. It has long been recognized that the theory of ionospheric layer formation is chiefly complicated by the fact that, as the sun's zenith distance x alters in the course of the day, the level of maximum ionization N_m lags behind the level of maximum electron production q_m. It is shown that the distance a between these two levels is equal to $(\tan x dx/dt)/2xN_m$, where x is the recombination coefficient and t is the time. An approximate solution of the continuity equation is used to investigate detailed features of the N, or N_m, curves near noon, and also to derive second-order approximations for a and for N_m. With the aid of these results, theoretical curves of the diurnal variations of N_m and the height at which it occurs may readily be computed for any latitude and time of year. The formulas are valid for the greater part of the solar day and

include 'Chapman function' corrections where necessary. A number of examples illustrating the significance of the 'time of relaxation' of an ionized layer $1/2\alpha N_m$ are quoted. The distorting influence of vertical drift on both N_m and $\tau(N_m)$ for an ionized stratum of E layer type is shown, for example, to depend on two factors only, namely the vertical drift characteristics and the time of relaxation of the ionized medium. *Subject Heading:* **1. Ionospheric layer formation.**—*Authors' abstract.*

12.4–142 551.510.535:551.594.13:550.388.2

Appleton, Sir Edward, **Region F2 anomalies.** *International Council of Scientific Unions. Mixed Commission on the Ionosphere, Third Meeting, Aug. 24–26, 1952, Canberra, Australia, Proceedings*, pub. **1953.** p. 53–70. 4 figs., 2 eqs. **DWB**—The anomalous behavior of the F2 layer can be illustrated comparing it with E and F1 layers. In 1946, APPLETON showed that in daytime fF2 is more closely correlated with geomagnetic latitude than with geographical latitude. Geomagnetic field plays a dominant part in causing the F2 layer to depart from simple formation. The discovery of geomagnetic content of the F2 layer has undermined the arguments on which the case for an annual effect was based. *Subject Headings:* **1. F2 anomalies 2. Geomagnetic latitude effects on F layer.**—*A.H.K.*

12.4–143 551.510.535:532.59:517.512.2

Herrinck, P. (*Met. Serv., Léopoldville, Belg. Congo*), **Tides in the F_2 ionospheric layer.** *Nature*, London, 184(4692) Supp. No. 14:1055–1056, Oct. 3, **1959.** fig., table, ref. **DWB**—From five years observations (1952–1958) at Léopoldville-Binza, an harmonic analysis of the mean diurnal variation of ym is obtained. The analysis shows a prominent first harmonic, associated with the following oscillations listed in order of decreasing amplitude: 8 hr, 4.8 hr and 12 hr. Half hour amplitudes are tabulated and eight hour oscillation is graphically represented. The conclusions drawn from harmonic analysis of the diurnal variation for each calendar month using mean values over five years are listed. *Subject Headings:* **1. F layer tides 2. Léopoldville-Binza, Congo Free State.**—*I.S.* ⑤

12.4–144 551.510.535:551.594.12:551.507.362.1

Holzer, Robert; Tepley, Lee and Goldberg, Phillip, **Some measurements related to upper atmosphere phenomena.** California. Univ. Institute of Geophysics, Contract W19-122-ac19, Final Report, Jan. 26, **1953.** 35 p. plates, figs., refs. at end of each ch. **DWB**—Results of 3 projects conducted between 1948 and 1951 with the purpose of producing and measuring an electric discharge in the ionosphere; the study of a mass spectrometer for measuring ions in or above the E layer; and a study of low frequency magnetic noise in order to determine solar effects on the ionosphere. The first project failed because of the V-2 flight failing. The method to be used was the concentration of the light from the discharge by means of a 60 in. searchlight mirror and detection by a photomultiplier tube. Two photographic methods were used to obtain spectrograms of the more intense spectral features of the discharge. One was by a tracking telescope and spectroscope, and the other a transmission grating and fixed cameras. *Subject Headings:* **1. Ionospheric discharges 2. Rocket instrumentation 3. Spectrograph measurements.**—*M.R.*

12.4–145 533.15:551.511:551.510.535

Mange, Phillip W., **The interpretation of diffusion times.** Pennsylvania. State Univ. Ionosphere Research Laboratory, Contract AF 19(604)-1304, Scientific Report, No. 83, March 1, **1956.** 37 p. 4 figs., table, 19 refs., 15 eqs. **DWB**—The "time of diffusion" criteria used to describe the rapidity of neutral molecular diffusion in the high atmosphere are compared. It is shown that these are not well defined in terms of absolute or relative concentration changes to be expected. However, it is found that some of these criteria have a relative altitude dependence for which a precise physical meaning can be given. A single relative criterion is then defined which is calibrated, without great difficulty, in the absolute sense, for a given constituent, and which has concrete physical meaning. As a supplement, the use of Lettau's theory for simultaneous diffusion and mixing is shown to support an earlier conclusion with regard to the action of turbulence affecting the distribution of molecular oxygen in the at-

mosphere above 100 km. *Subject Headings:* 1. Diffusion equations 2. Upper atmosphere diffusion.—*Author's abstract.*

12.4–146 551.510.535(99)

Bukin, G. V., **Ionosfernye nabliudeniia.** [Ionospheric observations]. *Sovetskaia Antarkticheskaia Ekspeditsiia, 1955–, [Trudy]*, Vol. 2, issued Leningrad, 1959. p. 111–114. 3 figs. **DWB** (M82/99 K81pe) -The results of vertical sounding of the ionosphere, carried out on the motor-ship "Lena" enroute to the Antarctic and also at Mirny are discussed in respect to variation of critical frequencies during day and night and also during various seasons of the year. These variations in values of the (foF2) and (foF1) are illustrated by two diagrams (isopleths). Minimum values of (foF2) were observed at nights during the winter and maximum in the daytime. At the period of intensive ionospheric disturbances the high frequency characteristics change sharply and at maximum disturbance complete absorption of the signals was observed for many hours or even days. These magnetic disturbances are illustrated in a chart. *Subject Headings:* **1. Ionospheric observations 2. Antarctic ionosphere 3. Antarctica.**—*N.P.S.* Ⓢ

D3. GEOMAGNETISM

See also: **Eclipse effects on geoelectric field** (Freier), 12.4–107; **Magnetic effects on radio star scintillation** (Koster, Wright), 12.4–116; **Solar cosmic rays near north magnetic pole** (Anderson, Enemar), 12.4–124; **Magnetic field effects on electron density** (Howells), 12.4–131; **Geomag. latitude effects on F layer** (Appleton), 12.4–142; **Magnetic effects on particle radiation** (Dessler), 12.4–157.

12.4–147 551.510.535:550.385.43

Francis, W. E.; Green, M. I. and Dessler, A. J. (*all, Lockheed Aircraft Corp., Palo Alto, Calif.*), **Hydromagnetic propagation of sudden commencements of magnetic storms.** *Journal of Geophysical Research*, Wash., D. C., 64(10):1643–1645, Oct. **1959.** 2 figs., 2 tables, 5 refs., eq. **DLC**—The article presents some development of the results obtained by previous investigations of the authors. A diagram of velocity of hydromagnetic longitudinal and transversal waves in the equatorial plane vs. altitude shows the importance of dissipation at lower altitude. Three paths in the equatorial plane of hydromagnetic waves generated at 6 earth radii are illustrated. It demonstrates that, in accordance with Fermat's principle, the ray paths remain very near the altitude of maximum velocity. Ion number density, average ionic molecular weight and hydromagnetic wave velocity for 14 altitudes, ranging from 150 to 25,000 km, are shown in a table. Transit and delay times for waves traveling in the earth's equatorial plane at 2, 4, 6, and 10 earth radii distances of generation from the earth's center are shown in another table. The mathematical formulas applied are explained. *Subject Headings:* **1. Sudden commencements 2. Magnetic storms 3. Hydromagnetic waves.** —*O.T.* Ⓢ

12.4–148 550.385.37

Duffus, H. J.; Shand, J. A.; Wright, C. S. and Nasmyth, P. W. (*all, Pacific Naval Lab., Esquimalt, B. C.*) and Jacobs, J. A. (*Dept. of Geophys., Univ. of B. C.*), **Geographical variations in geomagnetic micropulsations.** *Journal of Geophysical Research*, Wash., D. C., 64(5):581–583, May **1959.** 3 figs., 3 refs. **DLC**—A new attempt is presented to discover the origin and characteristic properties of geomagnetic micropulsations by comparison of data obtained between points of observations. Simultaneous observations were made at two stations (a base station and a mobile field station) on Vancouver Island, B. C., some 25 miles apart, in 1958. Significant differences consistently occurred when the results were compared with those obtained by quite distant observatories. The general similarity of records, however, suggests a point more than 25 mi away as the origin of the general daytime micropulsations. Analysis of the records of the two stations, showing a good similarity in each of the three components, is illustrated, combining the amplitude ratio with alternate experimental points and average values. The ratio of the vertical component indicates its rapid decrease at shorter periods. The importance is emphasized to reconcile the differences between the records of such closely situated stations to make comparisons with widely separated stations meaningful. Influence

of the high electrical conductivity of the sea is indicated. The investigation already has been extended by placing the field station some 250 mi away, and subsequently some 550 mi away in Southern Alberta. The documentation includes earth electricity, and geomagnetic pulsations related to the outer atmosphere. *Subject Headings:* **1. Geomagnetic micropulsations 2. Vancouver Island, British Columbia.**—*O.T.* Ⓢ

12.4–149 550.385.26

Ingraham, R. L. (*New Mexico College of Agric. and Mechanic Arts, State College*), **Note on the tidal theory of the S_q magnetic field.** *Journal of Atmospheric and Terrestrial Physics*, London, 16(3/4):263–273, Nov. **1959.** 9 refs., 4 eqs. **DWB, DLC**—The observed ratio of the diurnal to the semidiurnal components of the S_q field is greater than unity, although one would expect a ratio about a thousand times smaller on order of magnitude tidal theory. We therefore have made an exact calculation using a dynamo theory, with a certain analytically manageable model of diurnal and semidiurnal tides derived from the linearized Taylor-Pekeris theory to see whether "accidental" features might arise. It is shown that the anomaly persists. Possible explanations of the puzzle based on the details of this tidal theory are suggested. (1) There may be a resonating diurnal mode besides the well-established semidiurnal one. (2) Diurnal and semidiurnal motions rise to high maxima around latitudes 30°N and S and in the polar regions, respectively, as a result of the rotation of the atmosphere. This feature is ignored in both order of magnitude theory and in our model. The diurnal maxima should have much greater weight than the semidiurnal in the integral for the S_q field. *Subject Headings:* **1. Tidal theory of the S_q magnetic field 2. Geomagnetic theories.**—*Author's abstract.* Ⓢ

12.4–150 550.385.2(669):551.510.535

Onwumechilli, C. A. (*Physics Dept., Univ. College, Ibadan, Nigeria*), **The relation between *H*- and *Z*-variations near the equatorial electrojet.** *Journal of Atmospheric and Terrestrial Physics*, London, 16(3/4):274–282, Nov. **1959.** 7 figs., 4 tables, 7 refs. **DWB, DLC**—The parallelism in the variations of the geomagnetic horizontal component (H) and vertical component (Z), so obvious in the magnetograms of Ibadan, has been investigated. During daytime when the effect of the electrojet is dominant, H and Z vary proportionately. Numerous indentations of varying period and amplitude are a prominent feature of day-time variation curves of H and Z at Ibadan. Six hundred of these identations have been measured and analysed. The indentations attain their maximal values simultaneously in H and Z. Within the limits of experimental error, in 86% of the cases during the day and 54% of those during the night, the indentations also begin and end simultaneously in H and Z. The ratio r of the amplitude of an indentation in H to the amplitude of the same indentation in Z exhibits a remarkable diurnal variation, being constant for most of the day-time. The average value is 2.114 ± 0.021 during daytime and 4.112 ± 0.095 during the night. The ratio r is surprisingly independent of magnetic disturbance but decreases with increase in the period of duration T. For indentation of short periods T (e.g. not exceeding 15 min) the ratio r equals the ratio R of the diurnal range of H to the range of Z on undisturbed days. It is suggested that the indentations are caused by fluctuations in the quantity and quality of ionizing agents from the sun and that the decrease of r with increase in T is associated with vertical movements of the E layer of the ionosphere (or the S_q-layer). *Subject Headings:* **1. Geomagnetic field variations 2. Ionospheric-magnetic relationships 3. Ibadan, Nigeria.**—*Author's abstract.* Ⓢ

12.4–151 550.389(45)

Yokoyama, Izumi (*Geophysical Inst., Hokkaido Univ., Japan*), **Sulla distribuzione del campo geomagnetico all'Isola di Stromboli.** [Distribution of the geomagnetic field on the Island of Stromboli.] *Geofisica e Meteorologia*, Genoa, 7(3/4):53–55, May/Aug. **1959.** 4 figs., 5 refs. Italian and English summaries p. 55. **DWB**—The results of the geomagnetic survey on the Island of Stromboli are analysed from the standpoint of volcanology. Using the average values in the meshpoints (of meshes 500×500 M), the isanomalies of Z and H are newly drawn. The distribution proves to be most similar to that due to a subterranean dipole with its center at about 55 m under the sea-level. *Subject Headings:* **1. Geomagnetic field 2. Stromboli, Italy.**—*Author's summary.* Ⓢ

12.4-152 550.385.37

Jacobs, J. A. (*Geophys. Lab., Univ. British Col., Vancouver*), **Geomagnetic micropulsations.** *Nature*, London, 183(4658):381, Feb. 7, **1959.** 2 figs., ref. **DLC**—This report is a preliminary analysis of geomagnetic micropulsations obtained at Albert Head (48°23'N; 123°29'W) between Nov. 29, 1956 and Feb. 16, 1957. The records are analyzed by visual inspection, and periods of some 15 to 400 sec are observed for the fluctuations. A detailed account is forthcoming. *Subject Headings:* **1. Geomagnetic micropulsations 2. Albert Head, Vancouver Island, British Columbia.**—*N.N.* Ⓢ

12.4–153 550.385.43:551.594.5

Wescott, E. M.; Pope, J. H.; Dyer, D. O. et al. (*all, Geophysical Inst., Univ. Alaska*), **Rare hiss, earth currents and micropulsations on Nov. 27, 1959.** *Nature*, London, 185(4708): 231, Jan. 23, **1960.** 3 refs. **DWB**—A whistle of perhaps 2 kc/s was heard at approximately 1351 A.S.T. At the same time magnetic field micropulsations were initiated. An unusually abrupt sudden commencement on the Earth current record at College was also observed at the same time. A red auroral arc was observed later that day commencing in the north about 1645 A.S.T. *Subject Headings:* **1. Geomagnetic micropulsations 2. Sudden commencements 3. Auroral arcs 4. College, Alaska. I. Campbell, W. H.**—*E.Z.S.* Ⓢ

12.4–154 550.385.3:551.521.6

Bobrov, M. S. (*Acad. Sci., U.S.S.R.*), **A study of solar corpuscular streams based on world-wide geomagnetic disturbances observed during the IGY.** *Soviet Astronomy AJ*, New York, 3(6):943–950, May/June **1960.** 6 figs., 14 refs. **DLC.** Transl. of **Izuchenie solnechnykh korpuskulirnykh potokov na osnove mirovykh geomagnitnykh vozmushcheniĭ, nabliudavshikhsia vo vremia Mezhdunarodnogo geofizicheskogo goda.** *Astronomicheskiĭ Zhurnal*, Moscow, 36(6):1028–1036, Nov./Dec. **1959. DLC**—Studies of copies of magnetograms, kept at the IGY World Data Center B-2, Moscow suggest that the Earth can be divided into the following belts of geomagnetic disturbances; a belt of synchronous disturbances ($|\Phi| \lesssim 50°$); two belts of local disturbances (from $\Phi \sim 50°$ to the boundary of the nearest Polar zone); and two belts of permanent disturbances (the northern and southern Polar zones). The working hypothesis to suggest these divisions is explained. During synchronous disturbance the Earth passes through large condensation of solar plasms. The geomagnetic field prevents the matter of the condensation from approaching the Earth's surface nearer than one or several Earth radii. This causes the deformation of the geomagnetic field, which leads to synchronous disturbances. Small scraps of plasma tear away from the condensation, penetrate over the auroral zones into the upper atmosphere along Störmer trajectories, and cause local disturbances. Above the belts of permanent disturbances, the geometry of the geomagnetic field is such that the capture of the interplanetary matter is possible. Therefore, magnetic activity in these belts is observed even on quiet days. *Subject Headings:* **1. Solar corpuscular streams 2. Corpuscular radiation 3. Geomagnetic disturbances 4. IGY magnetic data.**—*From author's abstract (E.Z.S.).*

12.4–155 550.385.4

Chinburg, Dale L. (*State Univ. of Iowa*), **Great magnetic storm of March 31–April 3, 1960.** *Journal of Geophysical Research*, Wash., D. C., 65(7):2206–2208, July **1960.** 4 figs. **DLC**—Four figures summarize measurements of the scalar magnitude of the geomagnetic field vector F during the recent stormy period March 31, April 1, 2, 3, 1960. The measurements, whose absolute accuracy is estimated to be ± 1.2 gammas, were made at intervals of 1 minute with the State University of Iowa proton precession magnetometer. *Subject Headings:* **1. Magnetic storms 2. Magnetometers.**—*E.Z.S.* Ⓢ

12.4–156 550.385.43(213)

Maeda, Hiroshi and Yamamoto, M. (*both, Kyoto Univ.*), **A note on daytime enhancement of the amplitude of geomagnetic-storm sudden commencements in the equatorial region.** *Journal of Geophysical Research*, Wash., D. C., 65(8):2538–2539, Aug. **1960.** 2 figs., 5 refs. **DLC**—This report considers daytime enhancements of the amplitude of geomagnetic storm

sudden commencements in the equatorial region. The diurnal variations of the ratio of amplitude of *SC*'s (ΔH) at Kanoya, M'Bour Fanning, Ibadan, Jarvis, Muntinlupa, Huancayo Koror, Guam and Apia to those at Honolulu for 50 *SC*'s during IGY are plotted. *Subject Headings:* **1. Sudden commencements 2. Geomagnetic storms 3. Equatorial regions.** —*E.Z.S.* Ⓢ

D4. VAN ALLEN BELTS AND ZODIACAL LIGHT

See also: **Radiation measurement by second space rocket** (Vernov et al.), 12.4–57; **Van Allen belts and auroras** (Liemohn), 12.4–359.

12.4–157 550.382.7:551.521.64

Dessler, A. J. (*Lockheed Aircraft Corp., Palo Alto, Calif.*), **Effect of magnetic anomaly on particle radiation trapped in geomagnetic field.** *Journal of Geophysical Research*, Wash., D. C., 64(7):713–715, July **1959.** 6 refs. **DLC**—Anomalies in the geomagnetic field will affect the mirror altitude of trapped particles. A negative magnetic anomaly (abnormally weak magnetic field strength) will lower the mirror altitude of the trapped particles which are reflected near the anomaly. The large negative anomaly near Capetown, South Africa, will lower the local mirror altitude by about 1000 km. Since the trapped particles drift around the earth's magnetic axis, the outward projecting "horns" in the contours of constant radiation intensity as revealed by Satellite 1958 ϵ may be explained on the basis of this anomaly and the east-west drift of the trapped particles. The gap in the radiation belt as revealed by Lunar Probe Pioneer III is also apparently related to this anomaly, and the intensity at the minimum relative to the adjoining maxima indicates that most of the trapped particles are reflected at relatively low altitudes. *Subject Headings:* **1. Geomagnetic field anomalies 2. Van Allen belts.**—*Author's abstract.* Ⓢ

12.4–158 551.521.64

Kellogg, Paul J. (*Univ. Minnesota*), **Electrons of the Van Allen radiation.** *Journal of Geophysical Research*, Wash., D. C., 65(9):2705–2713, Sept. **1960.** 3 figs., 20 refs., 29 eqs. **DLC**—Calculations are presented for the flux of trapped electrons to be expected on the hypothesis that these electrons are β decay electrons from neutrons produced in the atmosphere by cosmic rays. It is shown that such electrons can form only a very small part of the observed electron component even in the inner zone. Furthermore, the observed energy spectrum is shown to be different from that expected from neutron β decay, and so other sources of neutrons are not worth considering. It is concluded that the observed electrons are most probably accelerated in place by high frequency electromagnetic fields. *Subject Heading:* **1. Van Allen belts.**—*Author's abstract.* Ⓢ

12.4–159 52:550.38:551.507.362.2:551.521.64

Lovell, A. C. B. (*Jodrell Bank Experimental Station, Univ. of Manchester*), **The exploration of outer space.** *Observatory*, London, 80(915):64–72, April **1960.** **DLC** (QB1 O2)—A review is given of what is known about the Van Allen radiation belts. It is suggested that similar radiation belts may surround the other planets of the solar system. No such belts have been found near the moon but this is not unexpected. The outer radiation belt is obviously linked with the major geophysical effect observed on the earth and seems to act as a reservoir of charged particles with the sun as a source and the earth as a sink. Radio observations of the sun show the sun to be of varying size according to the wave length used. It seems probable that there is a constant outward streaming of particulate material from the sun. This gives rise to what is termed the solar wind which appears to envelop the planets. More detailed studies of the moon and planets are projected using both satellite and radio-telescope techniques. An account is given of the results which it is hoped to achieve. The article concludes with a description of what is known about general cosmology and the possibilities of radio astronomy. *Subject Headings:* **1. Satellite research 2. Radio astronomy 3. Van Allen belts 4. Solar wind 5. Planets 6. Cosmology.**—*R.B.* Ⓢ

12.4–160 550.385:551.521.64

Van Allen, James A. (*State Univ. of Iowa*), **The geomagnetically trapped corpuscular radiation.** *Journal of Geophysical Research*, Wash., D. C., 64(11):1683–1689, Nov. **1959.** 2 figs., 19 refs. **DLC**—In the introduction the author refers to experts who are simultaneously studying the problems of this new phenomenon. The data from Pioneer IV on March 3, 4, 5 and 6, 1959 again confirm the general structure of the region of trapped radiation but show a very great enhancement of intensity and a considerable expansion of the outer zone following the great M region even on the sun on Feb. 25, 1959. In addition, these data provide information on the absorptivity of the radiation in both inner and outer zones and give a new determination of the cosmic ray intensity in interplanetary space. The nature, origin, geophysical role of the trapped radiation, preliminary intensity values in the heart of the inner zone at an altitude of 3600 km on the geomagnetic equator and, finally, the trapped corpuscular radiation around the moon and around other planets are discussed. *Subject Headings:* **1. Geomagnetic field 2. Cosmic radiation 3. Van Allen belts.**—*E.K.* Ⓢ

12.4–161 551.593.9:523.59

Fesenkov, V. G., **K voprosu o reduktsii nabliudeniĭ nad zodiakal'nym svetom.** [On the reduction of observations of zodiacal light.] *Astronomicheskiĭ Zhurnal*, Moscow, 35(3):323–326, May/June, **1958.** 5 tables, 3 refs., 3 eqs. **DLC**—Blackwell (1957) has shown that there is no definite relation between point source extinction according to Bouguer and the extinction corresponding to such an extended object as zodiacal light. In fact, the optical density of the atmosphere remains always the same, independently of the nature of the light source, although it is necessary to take into account the additional illumination of the troposphere produced by the zodiacal light itself. Calculations carried out in the case of normal orientation of the isophots relative to the horizon show that this effect produces an appreciable distortion of the apparent shape of zodiacal light. Assuming that the coefficient of transparency is equal to 0.83, and the scattering function corresponds to that found by Piaskovskaia-Fesenkova (1957), one found for different points of the same almucantar, at the zenith distance of 75°, and for various azimuths, the following relative increase in brightness:

A 0	10	20	30	40°
5.84%	7.83%	11.62%	15.95%	30.6%

Subject Heading: **1. Zodiacal light.**—*Physics Abstracts, No. 9146, 1959.*

12.4–162 523.51:523.59:551.593.9

Fesenkov, V. G., **Zodiakal'nyĭ svet kak produkt drobleniia asteroidov.** [Zodiacal light as the product of disintegration of asteroids.] *Astronomicheskiĭ Zhurnal*, Moscow, 35(3):327–334, May/June, **1958.** 2 figs., 2 tables, 8 refs. **DLC**—The disintegration of asteroids is at present being investigated experimentally, since for a number of meteorites it is possible to find the approximate data of their separation from a primary body and their transformation into individual bodies revolving around the sun and subject to the influence of primary cosmic rays. This process of disintegration leads to the appearance of a considerable amount of fine dust which spreads into space. The density of this dust, at a distance comparable with the earth-sun distance, which is necessary to explain the observed brightness of zodiacal light is only 10^{-23} 10^{-24} g/cm^3 (lower limit). The problem of the polarization of zodiacal light is more complicated. Atmospheric data lead to the conclusion that dry aerosols which contain a known fraction of meteoritic particles give an appreciable polarization. The strongest argument in favor of the meteoritic nature of zodiacal light, which results from the disintegration asteroids, is the good agreement between its observed form and the theoretical isophots calculated from the known distribution of asteroid orbits with inclination angles. One set of isophots given was calculated assuming a typical scattering function obtained by Piaskovskaia-Fesenkova (1957), while the other set was obtained assuming a spherical scattering function. The former is in better agreement with observations. *Subject Headings:* **1. Zodiacal light 2. Asteroid disintegration.**—*Physics Abstracts, No. 9147, 1959.*

E. SOLID EARTH GEOPHYSICS

1. GENERAL GEOPHYSICS

See also: **Fourth Internat. Conf. of Hungarian Geophys. Soc.** (Savarenskiĭ), 12.4–36; **Rocketry** (Mickelwait), 12.4–59; **Rocket experiment for measurement of gravitational time effect** (Lipps), 12.4–60.

12.4–163 551.5:550.3(71

Garland, G. D., **Current research in geophysics in Canada.** *Geophysical Journal*, London 2(1):45–50, March **1959.** 14 refs. **DWB, DLC**—The recent developments in the physics o the solid earth, especially concerning the behavior of the earth's crust and of the deeper interior are discussed. Research is being conducted by government laboratories, universities and b companies who are applying geophysical methods in exploration programs. Various project undertaken in the fields of seismology, gravity, terrestrial magnetism and other branches o earth physics, are reported. *Subject Headings:* **1. Physics of the solid earth 2. Geophysica research.**—*I.S.*

12.4–164 526.7:551.43

Stewart, Samuel W. (*U. S. Geological Survey, Denver*), **Gravity survey of Ogden Valley in the Wasatch Mountains, North Central Utah.** *American Geophysical Union, Transactions* 39(6):1151–1157, Dec. **1958.** 4 figs., 16 refs. **DWB, DLC**—Ogden Valley is a northwest trending valley in the Wasatch Mts of North Central Utah. From geologic investigations it i inferred that Ogden Valley is structurally controlled by normal faults along both the northeas and southwest margins. Gravity measurements in the valley indicate a fault with abou 2000 ft of vertical displacement along the west margin of the valley. A fault with at leas 1000 ft of vertical displacement is postulated along the east margin of the valley, and a smalle buried fault is postulated within the valley. The maximum thickness of Cenozoic sediment and sedimentary rocks in the valley is estimated to be about 5000 ft. *Subject Headings* **1. Structural geology 2. Gravity survey 3. Ogden Valley, Utah.**—*Author's abstract.*

12.4–165 531.51:526.7:517.512.2

†*U. S. Army Map Service, **Statistical and harmonic analysis of gravity.** Its *Technica Report*, No. 24, March **1959.** 141 p. 17 figs., 34 tables, 41 refs., 22 eqs.—Markov theory is developed in terms of two correlated functions, the free air gravity anomaly and the elevatio of the topography. The Markov methods are applied to 1°×1° means to extrapolate fron all available observations to obtain an estimate of the gravity field world-wide in the form o mean anomalies of 10°×10° squares. These estimates are adjusted so that the even degre zonal harmonics are consistent with the precessions of the node of satellite 1958 Beta and s that the inadmissible first and second degree harmonics are absent. Spherical harmoni coefficients up to the eighth degree (P_8^8 terms) for free air gravity are computed. An in dependent autocorrelation analysis is made to estimate the variance of mean anomalies o squares and the variance of each degree of the spherical harmonics. This analysis is utilize as a control on the error variance and covariances of the mean anomaly estimates made by the Markov estimates. The results are used in conjunction with the conditions on zona harmonics derived from satellite motions to obtain a best estimate of the exterior potential in spherical harmonics from terrestrial gravimetry up to June 1958 and satellite data up to December 1958. It is planned to revise this estimate periodically as new observational data are available. A general evaluation of results and comparison with other studies are given and techniques of application suggested. *Subject Headings:* **1. Markov theory 2. Terrestrial gravimetry 3. Harmonic analysis of gravity 4. Statistical analysis of gravity.**—*Author's abstract.*

12.4–166 521.931.4:551.324.433:551.578.462

Green, R. (*Geophys. Sec. Bur. of Mineral Resources, Melbourne*), **Polar wandering, a random walk problem.** *Nature*, London, 182(4632):382–383, Aug. 9, **1958.** 7 refs., 6 eqs. **DWB**—An attempt is made to fit the paleomagnetic data to a random walk of the pole over

the Earth's surface. In this work the pole paths relative to Europe and North America have been used because their similarity in shape and direction suggests that neither continent has been displaced in latitude relative to the other to any great extent. The angular displacement of the pole from its present-day position is plotted against the square root of time in millions of years. Thus the value of 3° of arc for the magnitude of the displacement of the pole in one million years was derived. It is emphasized that since the movement of the pole may be considered to be a random walk, there will be periods during which there is effectively little displacement of the pole (Quaternary) and periods during which rapid displacement of the pole is in evidence (Carboniferous). *Subject Headings:* **1. Polar displacement 2. Ice cap melting 3. Random walk.**—*E.Z.S.*

12.4–167 550.3 551.243

Goguel, J., **L'influence des failles et des autres irrégularités de l'écorce sur la compensation isostatique dans l'hypothèse de la régionalité.** [Influence of faults and other irregularities of the crust on the isostatic compensation in the hypothesis of regionality.] *Annales de Géophysique*, Paris, 14(1):1–30, Jan./March **1958.** 12 figs., 14 eqs., 7 refs. French and English summaries p. 1–2. **DLC**—The calculation of isostatic corrections made for geodetic purposes necessarily assumes the uniformity of the crust. The effect on gravity anomalies of irregularities in the structure of the crust, particularly major faults, is examined in order to use the anomalies for the study of the irregularities. Starting from Vening Meinesz's conception of a floating, homogeneous, elastic crust, the stresses resulting from the elastic deformation under the action of surface relief are calculated. This conception is completed by assuming that the crust is faulted; the vertical displacement of the crust in the neighborhood of the faults, the corresponding stresses, and the resultant gravitational effects are calculated for these faults. This method not only permits the calculation of the gravity anomaly corresponding to a given fault, but also permits the study of the mechanics of movement on a fault, in the case where the most recent movement occurred under topographic conditions similar to those of today. The fact that the horizontal stress in the crust is unknown makes it impossible to carry out this calculation for an isolated fault, but if there are several parallel faults, a relation between their movements can be obtained. As an example, this general method is applied to the Rhine Valley. The case of two parallel grabens is studied schematically and it is shown that the horst between them may be considerably elevated, simply by the restoring of isostatic equilibrium. Structures such as that of the Sinai Peninsula and the African rift valleys may possibly be explained by this process. Finally, the relation of positive anomalies in the Italian Alps and negative anomalies in the Po Valley is considered, and it is suggested that they may be consistent with isostatic equilibrium involving a large radius of regionality. *Subject Headings:* **1. Faults 2. Vertical displacement of earth's crust 3. Isostatic compensation 4. Rhine Valley 5. Italian Alps.**—*Author's abstract.*

E2. VOLCANOLOGY

12.4–168 551.21

Verhaeghe, M., **L'éruption du volcan Mugogo au Kivu.** [The eruption of the Mugogo Volcano in Kivu.] *Académie des Sciences, Paris, Comptes Rendus*, 246(20):2917–2919, May 19, **1958. DLC**—Study of the volcanic eruption which occurred on Aug. 1, 1957, in the central region of the Virunga volcanoes (Kivu, Belgian Congo) in a district which has always been considered as a dormant one. The eruption, preceded by earthquakes, began very suddenly and, in 42 hrs, had emitted 750,000 m^3 of solid matters, distributed in a cone 120 m long, 40 m high, and with an outflow of 1100 m. Three explosion craters were oriented following an East-West line. A detailed chemical analysis was made; it showed that the lava was an "ankaratrite." This volcano is thus the first historical volcano to produce an "ankaratrite." *Subject Headings:* **1. Volcanic eruptions 2. Mugogo Volcano 3. Kivu, Belgian Congo.** –*A.V.*

12.4–169 551.21:92

Macdonald, Gordon A., [**Obituary of**] **Dr. T. A. Jaggar.** *Nature*, London, 171(4357):774, May 2, **1953. DWB** –Thomas Augustus Jaggar, "Dean of American vulcanologists," born in Philadelphia Jan. 24, 1871, died in Honolulu Jan. 17, 1953. Professor of geology, Mass.

Inst. Technology. Established Hawaiian Volcano Observatory 1912, Director till 194
Subject Headings: **1. Vulcanology 2. Obituary of T. A. Jaggar 3. Thomas Augustus Jagga**
—*C.E.P.B.*

12.4–170 551.2

Jolivet, J. (*Laboratoire de Physique du Globe de Saint-Claude, Guadeloupe*), **La crise vo canique de 1956 à la Soufrière de la Guadeloupe.** [The volcanic eruption in 1956 of th Soufrière in Guadeloupe.] *Annales de Géophysique*, Paris, 14(3):305–322, July/Sept. **1958** 8 figs., 7 photos, 15 refs. **DLC**—Having described the state of the volcano before the eruption the premonitory phenomena observed in the field and on the seismograms are studied. Th three different periods of the volcanic eruption are then described: the clearing phase (20–2 Oct.), the paroxysmal phase (24–27 Oct.) and the terminal phase (from 27 Oct. to this day Successive modifications in the volcano are: appearance of a new fracture in the SE portio of the cone, enlargement of that fracture and appearance of secondary fractures, renewal c activity in some older fractures. The repercussions of the eruption on the volcanism of th island are then described. The study of the seismograms points out the presence of two type of readings. Finally, the 1956 crisis is compared to the older eruptions of the Soufrière *Subject Headings:* **1. Volcanic activity 2. Seismographic phenomena 3. La Soufrière, Gua deloupe.**—*Author's abstract.*

12.4–171 551.510.62:551.2

Kizawa, T., **Geophysical phenomena in volcanic activity (3).** *Journal of Meteorologica Research*, Tokyo, 3(10):368–377, July **1951.** 8+12 figs., tables, refs. In Japanese; Englis summary p. (22). **DWB**—At the time of volcanic activity of a crater under investigation not only was the magnetic north deflected considerably but also the direction of radio wave was influenced by the volcanic activity. During an eruption an electric wave of a frequenc of about 48 mc/sec was observed in the direction of the crater. *Subject Headings:* **1. Volcani influences 2. Radio wave propagation.**—*A.A.*

E3. SEISMOLOGY

See also: **Seismic soundings on moon** (Press et al.), 12.4–103.

12.4–172 550.34

Scholte, J. G. J., **On seismic waves in a spherical earth.** *Netherlands. Meteorologisch Instituut, Mededelingen en Verhandelingen*, No. 65, **1956.** 55 p. 24 figs., 15 refs., 16 eqs **DLC**—A monograph presenting a theory of seismic waves in the mantle and core of the earth taking into account the curvature of the boundaries and dealing with diffraction, reflection and other characteristics of waves of various types affected by the sphericity of the earth *Subject Heading:* **1. Seismology.**—*M.R.*

12.4–173 550.340.19 551.506.22:550.340.62(54

Tandon, A. N. (*Met. Office, New Delhi*), **Seismology in India during the IGY.** *Journal o Scientific and Industrial Research, Sec. A*, New Delhi, 17(12), Special Supplement, Dec. **1958** p. 99–100. **DWB, DLC**—An outline of the activities of the long established stations (10) plus the two new stations and their instrumentation is given. Reports are collected at the Central Seismological Observatory, Shillong, from where they are sent to the World Data Center "C" at Strasbourg, for processing. The activities at station Port Blair will continue beyond the IGY period because of the importance of storm data obtainable in the Bay of Bengal. *Subject Headings:* **1. Seismology 2. IGY seismology program 3. India.**—*W.N.*

E4. GEOTHERMY

See also: **Geothermal effects on glaciers** (Wexler), 12.4–185.

12.4–174 551.16(24)

Bullen, K. E. (*Univ. of Sydney*), **The deep interior.** (In: Bates, D. R. (*ed.*), **The Earth and its atmosphere.** N. Y., Basic Books, **1957,** p. 31–47. table.) **DLC**—Popular discussion

of the structure and physics of that part of the earth beneath the crust (20–25 mi deep). The earth's mass and mean density, moment of inertia, earthquakes, P and S waves, layers of the deep interior, detailed density distribution, pressure and gravity in the earth, elasticity, imperfections in elasticity, composition of the deep interior, and temperature (estimated at about >2000°C and <10,000°C). The core consists of a central core about 2160 mi thick and a mantle 1800 mi thick. The central core consists of an inner core 800 mi in radius and an outer core 1300–1400 mi thick. The latter is "certainly molten." A table shows the characteristics of the 8 regions of the earth's crust and core. *Subject Headings:* **1. Earth's interior 2. Earth's core temperature 3. Earth's core theories.**—*M.R.*

12.4–175 550.361(439.1)

Boldizsár, T., **Terrestrial heat-flow in Hungary.** *Nature*, London, 178(4523):35, July 7, **1956.** 3 refs. **DWB**—The heat flow q computed from shafts during borings to 550–600 m in Liassic shale in S. Danubia is $10^6 q = 3.035 \pm 0.010$ cal/cm²/sec. *Subject Headings:* **1. Geothermal gradient 2. Heat flow through rocks 3. Hungary.**—*C.E.P.B.*

12.4–176 550.361

Chadwick, Peter, **Heat-flow from the earth at Cambridge.** *Nature*, London, 178(4524): 105–106, July 14, **1956.** fig., 9 refs. **DWB**—Thermal measurements in a borehole at Cambridge, Eng., to 860 ft gave a heat flow from the earth of 1.28×10^{-6} cal/cm²/sec. To obtain equilibrium values this measured flow must be increased by 0.20×10^{-6} to allow for Ice Age cooling. Other determinations are compared. The mean of 17 in different parts of Britain is 1.57×10^{-6}. *Subject Headings:* **1. Geothermal heat flow 2. Cambridge, Eng.**—*C.E.P.B.*

12.4–177 550.36

Jacobs, J. A. (*Geophysics Lab., Toronto Univ., Toronto*), **Problems connected with the cooling of the earth.** *American Geophysical Union, Transactions*, 35(1):161–163, Feb. **1954.** fig., refs. p. 163. **DWB**—The composition of the Earth's core is reviewed and a physical explanation is offered as to how the Earth's inner core may have become solid. The question can arise if the radioactive content of the inner core is only about two per cent of that in the crust. Finally, it is shown that conduction alone will probably suffice to transfer the heat from the core through the surrounding mantle. *Subject Heading:* **1. Cooling of the earth.** —*Author's abstract.*

F. OCEANOGRAPHY AND HYDROLOGY

1. OCEANOGRAPHY

See also: **Atlantic Ocean influence on European weather** (Semenov), 12.4–12; **Oceanog. atlas, Atlantic** (Fuglister), 12.4–16; **Oceanog. surveys, Antarctica,** 12.4–22; **Extension of Eckman's theory of drift currents to arbitrary wind** (Ozmidov), 12.4–267; **Maps of wind field over ocean** (Sarkina), 12.4–303; **Pleistocene ocean temps., N. Atlantic, Arctic** (Ewing, Donn), 12.4–310.

12.4–178 551.482

Bol'shakov, V. S., **O kontakte rechnykh i morskikh vod v severo-zapadnoĭ chasti Chernogo moria.** [The meeting of river and sea water in the N.W. part of the Black Sea.] *Akademiia Nauk SSSR Izvestiia, Ser. Geofiz.*, No. 4:554–557 April **1958.** 7 figs., 3 tables, 15 refs., 3 eqs. **DLC**—With the aid of visual observation and photographs from airplanes, the author investigated the characteristics of the hydrofront –the line of contact of river and sea waters in the mouths of the Dnieper, Bug, Dniester and Danube Rivers. These studies were supplemented by studies on salinity and current flow carried out during the following year (1955). Sketch maps and a photograph showing the position of the boundary of the Dnieper-Buga estuary waters and the distribution of salinity and currents on the surface are presented. In all three regions the structure of the hydrofront, as observed from an airplane, appeared to be homogeneous. During calms and weak winds the hydrofront bends slightly and proceeds in its general direction. The outward boundary is marked by the color of the water. During

winds exceeding 4 m/sec the hydrofront scalloped. No vortices were observed along the ou lines of the hydrofront. The hydrological regime of the hydrofront is marked by considerab dynamic intensity. *Subject Headings:* **1. Hydrofronts 2. Black Sea.**—*I.L.D.*

12.4–179 551.526.6:551.46

Robinson, Allan (*Dept. of Physics, Harvard Univ.*) and Stommel, Henry (*Woods Ho Oceanog. Inst.*), **The oceanic thermocline and the associated thermohaline circulation.** *Tellu* Stockholm, 11(3):295–308, Aug. **1959.** 3 figs., 15 refs., 38 eqs. **DLC**—A study is made of th thermal structure of an ocean which is dynamically geostrophic, bounded by an eastern coas and driven by an imposed surface temperature distribution and wind stress. The heat equatio contains vertical diffusion in the form of a virtual eddy mixing parameter and nonlinear ter of vertical and north-south advection. Comparison of the results with the North Atlant shows an agreement with the observed temperature distribution in the thermocline regio including the deepening of isotherms in mid-latitudes. The value of the vertical compone of velocity at the bottom of the thermocline is predicted, and a numerical value for the eddy conductivity obtained. *Subject Headings:* **1. Ocean temperatures 2. Thermocline-therm haline circulation.**—*Authors' abstract.*

12.4–180 551.461.2:547.22:551.578.46:551.510.4

Wilson, A. T. (*Div. Nuclear Sci, Dept. of Sci. and Ind. Res., Lower Hutt, New Zealand*) **Surface of the ocean as a source of air-borne nitrogenous material and other plant nutrient** *Nature*, London, 184(4680):99–101, July 11, **1959.** fig., table, 6 refs. **DWB**—A paper dis cussing the occurrence of organic nitrogen in New Zealand snows and the probable origin of th air-borne nitrogenous material. Samples of snow analyzed were collected from above th vegetation line to avoid possibility of contamination by plant or animal debris. The analyse of these samples are tabulated. The geographical position of New Zealand suggests that th source is the ocean itself. The ocean, however, contains only about 0.008 p.p.m. of albuminoi nitrogen. Further, the analysis of snow shows that its potassium/sodium ratio is an order magnitude greater than that of sea water. It is, therefore, postulated that the upper, ver thin layer of the ocean has a different composition from that of the rest of the ocean; in pa ticular, that it is enriched in potassium, ammonium, organic material and organic nitroge and probably various other materials. The paper discusses the evidence in support of th hypothesis and later its application to other related problems. The relationship between th surface layer of the ocean and snow water is graphically shown by plotting the "excess p tassium concentration" against the "albuminoid nitrogen concentration." *Subject Heading* **1. Nitrogen in sea surface water 2. Sea surface layer-snow relationships 3. New Zealan** —*I.S.*

F2. GLACIOLOGY

See also: **Ice cap melting** (Green), 12.4–166; **Cryoconite holes, Thule** (Gerdel, Drouet), 12.4–282.

12.4–181 551.324.54:778.3

Finsterwalder, R., **Measurement of ice velocity by air photogrammetry.** (In: I.U.G.G Association of Scientific Hydrology, **Symposium de Chamonix, Sept. 1958,** pub. Gentbrugge **1958.** p. 11–12. 2 refs., 2 eqs.) **DWB** (551.311 1611sy)—Difficulties in measuring ic movements are outlined, and the advantages of aerial photogrammetry as well as methods o accounting for factors affecting the accuracy of the measurements are described. The accurac of parallax measurements is affected not only by the movement of the ice but also by th differences in the direction of the photographs compared and the differing positions of th cameras in flight. Aerotriangulation from one side of a glacier to the other will give the exac positions of all photographs and also the directions of all camera axes, and allow rectificatio of the photographs to a strictly vertical position. The difference in camera positions can als be compensated for by taking into account the differences in the positions between the photo graphs as determined by aerotriangulation. The height differences of the photographs can b corrected by enlarging one photograph in a rectifier. Formulas for calculating the parallaxe

from the rectified photographs and the displacement of the ice are given. *Subject Headings:* **1. Glacier movement measurement techniques 2. Aerial photogrammetry.**—*SIPRE abstract, No. 17358.*

12.4–182 551.521.14:551.324.414

Jaffé, Andreas, **Neuere Albedo- und Extinktionsmessungen an Gletschereisplatten.** [Recent albedo and extinction measurements on glacier ice sheets.] *Germany. Deutscher Wetterdienst, Berichte*, 8(54):273–274, **1959.** 3 figs. **DWB, DLC** –Slabs of ice (1.3 to 22 cm in thickness) were cut out of the Hintereisferner and radiation was measured (July 22–Sept. 5) by means of a Moll-Gorczyński solarimeter. All measurements were made over a square box with a black interior. The details of the measurement technique are presented. The reflectivity R of the ice slabs was found to increase with increase in thickness of the slab. An empirical equation was obtained, namely: $R(b) = 0.194(1 - e^{-0.39b}) + 0.034$ where b = thickness of slab and R = reflectivity. Measurements of the albedo of horizontal ice slabs during direct radiation show that the albedo increased markedly with diminishing solar altitude i.e., with increasing angle of incidence. This effect is independent of the variability of the direct surface reflection alone but derives from the diffuse back radiation from the interior of the ice slab. The extinction of direct radiation penetrating into the ice slab obeys Lambert's law. *Subject Headings:* **1. Albedo measurements 2. Albedo of glaciers 3. Lambert's law 4. Switzerland.**—*I.L.D.*

12.4–183 551.583.3:551.241:551.331.5

King, R. F. (*Dept. Geology, Birmingham Univ.*), **Glaciology and geodynamics.** *Journal of Glaciology*, London, 3(25):432–434, March **1959.** 3 refs. **DWB, DLC**—Some explanations for the former existence of ice caps in present temperate or subtropical regions are discussed. The author holds the uniformitarian view that climatic zones have not changed but that either or both polar wandering and continental drift have occurred. Measurements on remanent magnetization of rocks in Europe suggest that the pole moved into its present position in late tertiary time. The polar paths for different continents are not identical, thus suggesting that continental drift has occurred. PAULY and HAPGOOD postulate relative movements of the lithosphere over the mantle. SCHEIDEGGER envisages movements of the earth as a whole and finds continental drift the least unsatisfactory theory of orogenesis. *Subject Headings:* **1. Geodynamics 2. Glacial period theories 3. Climatic changes.**—*E.Z.S.*

12.4–184 551.578.463(988)

Landauer, Joseph K. (*SIPRE, U. S. Army Wilmette, Ill.*), **On the deformation of excavations in the Greenland névé.** *International Union of Geodesy and Geophysics. Association of Scientific Hydrology, Toronto, Sept. 1957*, [*Transactions*], Vol. 4, pub. **1958.** p. 475–491. 9 figs., 7 tables, 3 refs., 14 eqs. **DWB, DLC**—Deformations occurring in a tunnel, two trenches, and a 30 m deep pit excavated in the Greenland névé in the summer of 1954 have been measured over a period of 2 years. The experimental results indicate that closure rates increase with lateral distance from a restraining boundary up to distances of about 1 m. At larger distances, the effect of the boundary is not appreciable. Closure rates for deep excavations are not found to be strongly depth-dependent. This is due to a roughly parallel increase of viscosity and pressure with depth. Vertical compaction results from the pit agree well with those calculated from the depth-density relation using Sorge's Law. A theoretical calculation for the tunnel and pit closure, which is a modification of existing theories for the deformation of an elastic, compressible, thick-walled cylinder, is in fair agreement with the observed deformations. From this agreement it appears that the flow behavior of the névé can be described on the basis of a Newtonian viscosity. The trench closure is described as the squeezing out of horizontal layers, fixed at some distance from the trench, and modified only slightly by the drag of neighboring layers. Measurements will be continued during future summers. *Subject Headings:* **1. Névé research 2. Greenland.**—*Author's abstract.*

12.4–185 551.583.3:551.324.412:551.324.5

Wexler, H. (*IGY Antarctic Prog., Nat'l. Acad. Scien., Wash., D. C.*), **Geothermal heat and glacial growth.** *Journal of Glaciology*, London, 3(25):420–425, March **1959.** 2 figs.,

7 refs., 3 eqs. **DWB, DLC**—In a 300 m deep hole drilled in the 3000 m thick ice at Byrd Station (lat. 80°S long. 120°W, 1513 m above sea-level), the temperature was observed to decline with depth below 45 m. This profile was extended to the bottom of the ice with the aid of heat conduction theory under these assumptions: (i) that as the ice was deposited the climate became warmer at the rate of 0.45°C per 1000 years; (ii) the conduction of geothermal heat is 31.6 cal cm^{-2} yr^{-1}. It is estimated that the first 2000 years of geothermal heat conducted to this ice, whose annual accumulation is 30 cm, is dissipated to the atmosphere and space. When the ice becomes thicker, it retains all the geothermal heat given to it for a long time. An alternative, nonclimatic change explanation of the decreasing temperature in the Byrd Station hole is based on colder ice from higher elevations moving under the warmer ice accumulated locally. However, an examination of the topography of the Marie Byrd Land ice does not appear to support this explanation. *Subject Headings:* **1. Geothermal effects 2. Glacial growth 3. Marie Byrd Land, Antarctica.**—*Author's abstract.*

F3. HYDROLOGY

See: **Forest-water resources relationships** (Friedrich), 12.4–31; **Sec. on Hydrometeorology**, p. 752.

METEOROLOGICAL OBSERVATIONS AND INSTRUMENTS

METHODS OF OBSERVATION (551.501)

See also: **Climat. probability nomograms** (Lebedev), 12.4–11; **Ionos. stations, Antarctica** (Panzarini), 12.4–23; **Antarctic weather stations** (Doyen), 12.4–25; **Antarctic weather stations**, 12.4–27; **Use of radar stations at Rostov** (Tsyganov), 12.4–38; **Humidity charts and diagrams for use in lumber drying** (Smith), 12.4–95; **Ionos. drift measurement techniques** (Erofeev et al.), 12.4–133; **Refractive index tables** (Shinn), 12.4–136; **Micrurgic identification of particulate material** (Cadle), 12.4–214; **Radar analysis of precip., Kanto District** (Imai et al.), 12.4–280; **Auroral radar reflections** (McNamara), 12.4–350.

12.4–186 551.501.4/5:551.589.5

Mehra, N. C. (*Defence Res. Lab., Kanpur*), **Expression of climate based on frequency and duration of simultaneously occurring dry and wet bulb temperature ranges.** *Journal of Scientific and Industrial Research*, Sec. A., New Delhi, 18(4):166–171, April **1959.** 2 figs., 4 tables, 2 refs. **DWB, DLC**—The conventional method of expressing climatic data as mean maximum or minimum or averages does not show their frequency, duration or ranges, nor their relationship to concurrent phenomena. The double frequency or contingency tables and histograms presented in this paper express the climatic data in a much better manner than the frequency tables of single climatic elements can, and readily indicate the ranges, and frequency and duration of various levels of any two concurrent climatic elements and their interrelationship. *Subject Headings:* **1. Climatic data presentation 2. Contingency tables 3. Frequency data 4. Dry bulb temperature ranges 5. Wet bulb temperature ranges.**—*Author's abstract.*

12.4–187 551.501.4:551.578.4:551.43

Reynolds, Geoffrey (*North of Scotland Hydro-Electric Board*), **Snowfall losses at mountain raingauges.** *Weather*, London, 14(11):351–356, Nov. **1959.** 2 figs., 3 refs., eq. **DWB**—The author develops a method of estimating winter precipitation (including snow) on mountain sites. The method is based upon the validity of isomeric rainfall maps expressing average monthly rainfall totals as a percentage of the annual average and the fact that ratios between the catches of two adjacent ideally sited gages, only a few miles apart, remain nearly constant throughout the year. This ratio can be computed for the snow-free part of the year and used to estimate the precipitation at the high level or inaccessible gage from the daily readings of the low level and well-attended gage during the winter months. The results of such an in-

vestigation carried out on the basis of the 1954–1958 records of the North of Scotland Hydro-electric Board's gages in the vicinity of the catchment area of the River Garry in Inverness-shire are presented. Curves of the smoothed monthly mean ratios which the other Garry gages bear to the catch at Kirgie Camp are presented. The winter precipitation for the various gage stations is estimated and the winter losses of catch are calculated. *Subject Headings:* **1. Rain gage data analysis 2. Precipitation estimation 3. Inverness-shire, Scotland.** —*I.L.D.*

12.4–188 551.501.75:551.557:551.542.1

Rudloff, Willy (*Hamburg*), **Der Gradientwind im wandernden Luftdruckfeld.** [Gradient wind in a moving air pressure field.] *Annalen der Meteorologie*, Hamburg, 8(11/12):321–326, **1959.** German and English summaries p. 321. **DWB, DLC**—The influence of the movement of a pressure field in the computation of the gradient wind can be included in a modified geostrophic wind by which it is possible to use the common equation for the gradient wind. Several nomograms allow a simple graphical computation for practical purposes. *Subject Headings:* **1. Gradient wind computation 2. Pressure fields.**—*Author's abstract.*

12.4–189 551.501.71:551.574.1:551.510.42

Twomey, S. (*C. S. I. R. O., Sydney, N. S. W., Australia*), **Hygroscopic particles in the atmosphere and their identification by a phase-transition method.** *American Geophysical Union, Geophysical Monograph*, No. 3:1–10, **1959.** 3 figs., 11 refs., table. **DLC, DWB**—A paper reporting measurements of phase transition and other measurements made in the atmosphere over southeastern Australia. These measurements were made outside the immediate vicinity of industrial centers and above the first 500 ft of the atmosphere. The investigations showed that sea salt particles were by far the most important soluble constituents (and a major over-all contributor) in the size range above one micron. Soluble particles near the phase-transition point and a sea salt particle under increasing relative humidity are shown photographically. Predicted transition humidities for a number of salts are tabulated and scatter diagram for ratio of "halo" diameter to particle diameter is included. No significant change was found to take place during the passage of maritime air inland. Reductions in total number could be traced to mechanical removal processes in rain and cloud, while a falling off at lower levels was largely balanced by an increase at higher levels. It is found that the importance of giant particles to cloud physics (not necessarily rain formation) is not as much as that of cloud nuclei in the range -5×10^{-6} to 10^{-4} cm. *Subject Headings:* **1. Hygroscopic particles 2. Sea salt hygroscopic particles 3. Cloud nuclei 4. Cloud physics.** —*I.Z.S.*

12.4–190 551.501.74:551.511:551.524:551.547.1

Jurčec, Vesna (*Zagreb*), **O nekim metodama odredivanja visine 850 mb plohe prema podacima visinskih stanica.** [Some methods for obtaining the 850 mb surface height by using data from mountain stations.] *Zagreb. Yugoslavia. Hidrometeorološki Zavod NR Hrvatske, Rasprave i Prikazi*, 8(4):121–128, **1959.** 6 figs., folded graph, 2 tables, 2 refs., 8 eqs. Serbo-Croatian and English summaries p. 121. **DWB**—In the paper are described some methods of pressure height evaluation by means of two stations with different altitudes (l.g. Sljeme H_B 1016 m, Zagreb-Grič H_B 162 m). The "Adiabatic" method is based on the evaluation of the pressure height relationship by the use of the virtual temperature of the stations Sljeme and Grič (Eq. (2), Fig. 1). Greater accuracy in approximation of the height is obtained by use of the mean virtual temperature between Sljeme and Grič (Eq. (1), Fig. 3). If we have the data only of the higher station then by Eq. (1) from pressure P_1 temperature T_1 and an appropriate lapse rate of virtual temperature one can obtain the height H_1. The best results yielded "*D*-method," invented by BELLAMY. "*D*" is the difference between the actual height of a pressure surface and the height H_p of the same pressure surface in the standard atmosphere (Eq. (5)). The actual temperature is indicated by means of the specific temperature anomaly "S" at given pressure (Eq. (6)). In Figs. 2, 4 and 6 the departures of heights obtained by the described methods from the heights computed by the methods B. MAKSIC are shown. At the end, the comparison of this last method (Fig. 9) with the heights obtained by sounding is given.

Subject Headings: **1. Pressure height calculations 2. Temperature data 3. Adiabatic charts 4. Yugoslavia.**—*Author's summary.*

12.4–191 551.501.777:551.508.77:551.588.2

Pašič, Hamid (*Sarajevo*), **O Oborinama I mjerenju oborina u planinama.** [Precipitation and precipitation measurement in high mountains (summary only).] *Zagreb, Yugoslavia. Hidrometeorološki Zavod NR Hrvatske, Rasprave i Prikazi*, 8(4):27, **1959.** Serbo-Croatian and English summaries only. **DWB**—In the high mountains, the measurement of the volume of real precipitation falling on the ground is made possible by lowering the gage orifices or by the use of shelter devices on ordinary raingages. According to the first method, the measurements taken at Bjelasnica mountain observatory (2067 m altitude), show a difference of 16% in favor of the lowered instrument. The second method employs a gage with an aerodynamic wing turning on a vertical axis and thus reducing the turbulence and the Jevans effect. In the case of isolated measurements the differences are sometimes important, but it is necessary to pursue the comparing measurement for the purpose of studying the instrument. The precipitation measurements taken with raingages with inclined orifices on mountain slopes have in various cases shown specific differences, which are presented in a special table. *Subject Headings:* **1. Precipitation measurement techniques 2. Rain gages 3. Mountain observation techniques 4. Bjelasnica, Yugoslavia.**—*From author's abstract.*

12.4–192 551.501.81:551.577.37

Saxton, J. A. (*Radio Res. Station, Dept. of Sci. & Industrial Research*), **The influence of atmospheric conditions on radar performance.** *Institute of Navigation, London, Journal*, 11(3):290–303, **1958.** 4 figs., 14 refs. **DWB, DLC**—The paper reviews the influence of gaseous absorption and of precipitation of various forms in the atmosphere on the performance of centimetre-wave radar equipment, special reference being made to the phenomena to be expected at a wavelength of 3 cm in view of the wide use of this wavelength for marine navigational radar. The greatest adverse effect is caused by widespread heavy rain, which leads to serious reductions of detection range, particularly in tropical-equatorial regions. The influence of super-refraction in the atmosphere is also discussed, and it is shown how skip effects may occur at times at certain ranges. *Subject Headings:* **1. Radar performance 2. Precipitation effects on radar echoes 3. Skip effects 4. Atmospheric refraction.**—*Author's abstract.*

12.4–193 551.501.83:551.594.6

Nakai, Taketosi and Suzuki, Y., **A study of atmospheric noise at 50 kc.** *Nagoya. Univ. Research Institute of Atmospherics, Proceedings*, 6:22–37, Jan. **1959.** 13 figs., 4 tables, 4 refs., 8 eqs. **DWB**—Measurements of the characteristics and level of atmospheric noise at 50 kc have been made since June 1957, that is, the cumulative amplitude probability distribution in the envelope of atmospheric noise and the field strength of integrated atmospherics have been studied. The relations between the statistical parameters of noise, i.e., the measured field strength of integrated atmospherics, the estimated average voltage and a series of noise parameters in the amplitude probability distribution have been obtained. The mean of the measured amplitude probability distributions is deduced with regard to the measured field strength of integrated atmospherics or the estimated average voltage, and in particular, for the latter parameter, an expression for the mean amplitude probability distribution is deduced. The impulsiveness of the noise is investigated with reference to the impulsive excursion of the trace of pen caused by the pulses of large peak appearing intermittently. The contribution of the parts of noise envelope which exceeded over the threshold of very high voltage is investigated with regard to the average voltage of the mean square voltage of the noise envelope. *Subject Heading:* **1. Sferics.**—*Authors' summary.*

OBSERVATIONAL DATA (551.506)

See: **Upper air obs. during eclipses** (Kitaoka), 12.4–106; **Global radiation data, Hradec Králové** (Pícha), 12.4–241.

INSTRUMENT CARRIERS (551.507)

See also: Sec. B2, p. 682; **Satellite obs.**, 12.4-2; **Airplane cloud physics measurements** (Zaĭtsev, Ledokhovich), 12.4–7; **High altitude balloons** (Anderson), 12.4–123; **Rocket instrumentation** (Holzer et al.), 12.4–144.

12.4–194 551.55:551.542.1:551.507.3

Angell, J. K. (*U. S. W. B., Wash., D. C.*), **Some statistics on the magnitude of the ageostrophic wind obtained from constant level balloon data.** *Monthly Weather Review*, Wash., D. C., 87(5):162–170, May **1959.** 11 figs., 9 refs., 4 eqs. **DWB, DLC** On the basis of wind speeds and accelerations derived from U. S. Navy sponsored 300 mb constant level balloon or transosonde flights made during 1953, 1955, and 1956, statistics are presented on the magnitude of the ageostrophic wind and its variation with latitude and wind speed. These statistics indicate that at 300 mb the average angle between wind and geostrophic wind is 11 degrees and the mean magnitude of the vector deviation between wind and geostrophic wind is 12 m sec^{-1}. The data also show that through the use of the geostrophic and gradient wind approximations, half the time errors greater than 29% and 11%, respectively are introduced into the derived results. *Subject Headings:* **1. Ageostrophic wind 2. Constant level balloon data 3. Transosonde flight data.**—*Author's abstract.*

INSTRUMENTS (551.508)

See also: **Mass spectrometer measurements in upper atmosphere** (Istomin), 12.4 55; **Moisture measurement instruments** (Stern), 12.4 96; **Precip. measurement in high mts., Yugoslavia** (Pašić), 12.4–191; **Lysimetry symposium** (Leyton, Green), 12.4–328.

12.4–195 551.508.21/5

Fritschen, Leo J. and Van Wijk, W. R. (*both, Iowa State College*), **Use of an economical thermal transducer as a net radiometer.** *American Meteorological Society, Bulletin*, 40(6):291–294, June **1959.** 3 figs., 8 refs. Also: Suomi, Verner E. (*Univ. of Wisconsin*) and Kihn, Peter M. (*U. S. W. B.*), [**Note on**] **L. J. Fritschen and W. R. Van Wijk: Use of an economical thermal transducer as a net radiometer.** *Ibid.*, 41(1):32, Jan. 1960. 5 refs. **DWB, DLC**—An instrument used to measure net radiation is described. A number of these instruments, because of their size and inexpensiveness, can be used in an experiment when attached to a single recorder by a switching mechanism. *Subject Headings:* **1. Radiometers 2. Radiation measurement devices.**—*Authors' abstract.*

12.4–196 551.508.25

Funk, J. P. (*C. S. I. R. O., Div. Met. Physics, Australia*), **Transient response of net radiometers.** *Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. B*, Vienna, 10(2):228–231, **1960.** 2 figs., 4 refs., 2 eqs. English, German and French summaries p. 228. **DWB, DLC**—The response of a net radiometer to a sudden irradiation is shown to give generally a marked overshoot which during calibration is mostly overlooked. This overshoot also simulates a high speed of response. An improved design of net radiometer minimizes this effect and also gives a high sensitivity. *Subject Heading:* **1. Radiometers.** –*Author's abstract.*

12.4–197 551.508.25:551.508.93

Volz, F. (*Blue Hill Obs., Milton, Mass.*), **Photometer mit Selen-Photoelement zur spektralen Messung der Sonnenstrahlung und zur Bestimmung der Wellenlängenabhängigkeit der Dunsttrübung.** [Photometer with a selenium photoelement for the spectral measurement of solar radiation and for the determination of the wave length dependence of haze turbidity.] *Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. B*, Vienna, 10(1):100–131, **1959.** 16 figs. (incl. photos), 8 tables, 18 refs., 4 eqs. German, English and French summaries p. 100–101. **DWB, DLC**—Until now only actinometers have been used for the routine determination of the turbidity of the atmosphere by haze. These instruments have thermal receivers for solar radiation. Filter measurements (difference measurements) and laborious evaluations are needed to determine the haze extinction and its wave length dependency and to separate it from the water vapor absorption. A handy little photometer has now been developed with the aid of which the blue and the red radiation of the sun can be measured. The receiver is a

selenium photoelement. For a selection of the best type of photoelement the short time fatigue and the temperature coefficient of the photocurrent as well as the distribution of the spectral sensitivity have been measured. The temperature dependence of the transmission of different glass and foil filters has also been studied. For the new sun photometer the Schott filter BG 12 and a filter like the RG 1 are used; the effective wave lengths of incoming radiation are $\lambda 0.44$ and 0.64μ. The photocurrent is measured by a technical microammeter. A special device at the sun photometer allows the direct reading of the optical air mass M. The evaluation of the radiation measurements with the modified turbidity diagram by SCHUEPP leads to the turbidity coefficient B and the wave-length exponent α, by which the size distribution of the aerosol is characterized. From the estimated visibility range S_v and B the scale height H_D of the homogenized haze layer can be calculated. *Subject Headings:* **1. Photoelectric photometers 2. Solar radiation measuring equipment 3. Turbidity meters 4. Selenium photoelement.**—*Author's summary.*

12.4–198 551.508.25:551.508.93:551.521:551.593.54

Volz, Friedrich, **Spektrale Messungen der Sonnenstrahlung und Trübungsbestimmung mit Selenzellen-Kleinphotometern.** [Spectral measurements of solar radiation and turbidity determination by selenium cell microphotometers.] *Germany. Deutscher Wetterdienst, Berichte*, 8(54):280–284, **1959.** 6 figs., 5 refs. German, English and French summaries p. 280. **DWB, DLC**—A handy little photometer has been developed with the aid of which the blue and red radiation of the sun can be measured (effective wave lengths 0.45 and 0.64 microns). The photocurrent is measured by a selenium photoelectric cell and a technical microammeter. Filters and the selected photoelectric cell have very low temperature coefficient. Because of the short duration of the measurements the photocurrent shows no fatigue. A special device at the sun photometer allows the direct reading of the optical air mass M. The evaluation of the radiation measurements with a turbidity diagram leads to the decadic turbidity coefficient B ($\lambda 0.5$ microns) and to the wave length exponent α, by which the size distribution of the aerosol is characterized. Series of measurements from the Alps and from the North Atlantic Ocean demonstrate the reliability of the sun photometer with very clear air. One can expect that the use of such instruments on different locations in connection with observations of the haze turbidity types may give extended insights into meteorological, synoptic, physical and industrial problems of the aerosol. *Subject Headings:* **1. Solar radiation measuring equipment 2. Photoelectric photometers 3. Turbidity meters 4. Selenium cell microphotometers.**—*Author's abstract.*

12.4–199 551.508.54

U. S. Forest Service Intermountain Forest and Range Experiment Station, Missoula, Montana, **Totalizing wind counter for contacting-type anemometers.** *U. S. Forest Service, Technical Equipment Report*, No. F-2, May 5, **1958.** 6 p. 3 figs. **DWB** (M08.5 U583to)—Gives the description of modernized equipment for a totalizing wind counter. The equipment can be easily handled by the observer, and yet it can obtain the most consistent and reliable data. It is designed for low-cost operation. The California Forest and Range Experiment Station used this equipment with satisfactory results in 1956. Details on its circuit operation are given. *Subject Heading:* **1. Anemometers.**—*N.N.*

12.4–200 551.508.59

Smith, Maynard E., **A potentiometer system for the continuous indication of recording of wind direction.** *Journal of Meteorology*, Boston, 16(3):335–337, June **1959.** 4 figs. **DWB, DLC**—The device described by the author with the aid of a photograph and a diagram consists of a twin brush potentiometer, turned at one half of a vane and a switch system in the transmitter attached to a standard milliammeter. "This device can be used with standard recorders and it requires only three wires between the transmitter and the recorder." *Subject Headings:* **1. Potentiometer system 2. Wind direction recorders.**—*I.L.D.*

12.4–201 551.508.71:551.510.53:551.571.7

Barclay, F. R.; Elliott, M. J. W.; Goldsmith, P. and Jelley, J. V. (*all, Atomic Energy Res. Estab., Harwell*), **A direct measurement of the humidity in the stratosphere using a cooled-**

vapour trap. *Royal Meteorological Society, Quarterly Journal*, 86(368):259–264, April 1960. 2 figs., 11 refs. **DWB, DLC**—A vapor trap designed for sampling the water vapor and carbon dioxide of the stratosphere is described. The results of one flight at about 27 km over southeast England are given and discussed. *Subject Headings:* **1. Stratospheric humidity instruments 2. Carbon dioxide in the stratosphere 3. Vapor trap 4. Southeast England.**—*Authors' abstract.*

12.4–202 551.524:551.508.71:536.74

Dufour, L., **Sur une extension de la notion de température thermodynamique du thermomètre mouillé.** [Extension of the concept of thermodynamic temperature of the wet bulb thermometer.] *Beiträge zur Physik der Atmosphäre*, Frankfurt a.M., 32(3/4):153–157, **1960.** 5 refs., 16 eqs. German, English and French summaries p. 153. **DWB, DLC**—The definition of thermodynamic wet bulb temp. is given when the water vapor used for saturation of the air is provided by an electrolyte solution instead of pure water. This definition is expressed by formula (15) which generalizes the classical formula (16) of the thermodynamic wet bulb temp. Finally formula is applied to a sodium chloride solution and the variation of the new thermodynamic wet bulb temp. with the molality of the solution is completed. *Subject Heading:* **1. Thermodynamic wet bulb temperature.**—*Author's abstract.*

12.4–203 551.508.79:551.579.5

Borel, G., **A portable instrument for measuring soil moisture.** *Netherlands Journal of Agricultural Science*, Wageningen, 8(2):132–138, May **1960.** 7 figs., 9 refs. **DA**—A description is given of a portable measuring instrument for determining soil moisture. The most important features are small dimensions, low energy consumption and simple handling. The dimensions of the instrument are 200×150×110 mm and its weight is 2.100 grams; it is fed by two 4.5 v batteries. The instrument is provided with two types of transducers, the gypsum block type and now also the nylon transducer. The advantages and disadvantages of these two transducers are examined. There are three measuring ranges (1,000,000–10,000 ohm; 10,000–1000 ohm and 1000–25 ohm). Gauging is done by turning the potentiometer knob thereby obtaining at the same time a compensation for the ambient temperature and a correction for the battery voltage. The author describes in a detailed manner the process for determining the soil moisture, operating principle of the instrument and the directions for use. The first experimental results seem to prove that it is preferable to use the gypsum block for lower soil moistures and the nylon transducer at places where higher soil moisture also has to be measured. *Subject Headings:* **1. Soil moisture instruments 2. Soil moisture measurement techniques.**—*A. V.*

12.4–204 557.508.91 551.584.5:551.510.42(436.14)

Steinhauser, Ferdinand (*Vienna*), **Messungen der Luftverschmutzung in Wien.** [Air pollution measurement in Vienna.] *Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. B*, Vienna, 10(2):200–209, **1960.** fig., 6 tables, 2 refs. German, English and French summaries p. 200. **DWB, DLC**—The amount of contamination of the air at the Zentralanstalt für Meteorologie und Geodynamik, Vienna, is being measured daily by determination of the albedo of a piece of filter paper after sucking air through it for 24 hours. The albedo of the paper is a measure of the amount of dirt particles in the air. The measuring apparatus is described. The observations obtained since Dec. 1, 1957, are analyzed statistically. The annual variation of the atmospheric contamination and its dependence on various meteorological factors, such as wind direction, wind speed, precipitation and fog, are discussed in detail. *Subject Headings:* **1. Atmospheric pollution measurement techniques 2. Atmospheric pollution-weather relationships 3. Vienna, Austria.**—*Author's abstract.*

12.4–205 551.508.94:551.594.11:551.594.13

Adamson, J. (*Physics Dept., Univ. Durham*), **The compensation of the effects of potential-gradient variations in the measurement of the atmospheric air-earth current.** *Royal Meteorological Society, Quarterly Journal*, 86(368):252–258, April **1960.** 4 figs., 7 refs. **DWB, DLC**—A well-known method of determining the atmospheric air-earth current consists of collecting and measuring the current flowing into an insulated receiver at ground level. A difficulty

encountered, however, is that any variation of the potential gradient produces a displacemen of the bound charge on the collector, leading to a spurious "displacement" current. In th simplest form of the method, this current can occasionally be so large as to mask completel the true-earth current. This article describes a development in which the sum of the air-eart and displacement currents is measured at one terminal of a differential amplifier, while field machine provides automatic and continuous compensation for the displacement curren at the other terminal. The apparatus thus enables a continuous true recording of the air earth current to be made, and is an improvement on previous methods of eliminating th displacement current which necessitated intermittent recording of the integrated charg collected over a period of time. Satisfactory results are obtained with this method in a weather conditions except thunderstorms. *Subject Headings:* **1. Air-earth current measure ment techniques 2. Potential gradient variations.**—*Author's summary.*

SYNOPTIC ANALYSIS AND FORECASTING (551.509)

See also: **Numerical forecasting** (Gubin), 12.4 8; **Long range forecasting for European U.S.S.R.** (Semenov), 12.4–12; **Seasonal forecasting manuals** (Isaev), 12.4–14; **Radio communication, Antarctica,** 12.4–24; **Meteorological service for regional dispatching** (Tsyganov), 12.4–38; **Telephonic weather forecasts** (Seilkopf), 12.4–66; **Synoptic analysis of cloud photographs** (Conover, Sadler), 12.4–274; **Objective forecasting of cirrus clouds** (Farnham), 12.4–275; **Mesoanalysis of rainfall intensity, Kanto District** (Imai et al.), 12.4–280; **Flood classification and forecasting, Central Europe** (Lambor), 12.4–289.

12.4–206 551.509.

Averbukh, S. K. and Pozdniakova, V. A., **Rezul'taty ispol'zovaniia vyvodov nekotoryk issledovanii pri sostavlenii dolgosrochnykh prognozov pogody maloĭ zablagovremennost** [The results of the use of the conclusions of certain investigations in the preparation of lon range weather forecasts, prepared a short time in advance.] *Moscow. Tsentral'nyĭ Institu Prognozov, Trudy,* 73:100–105, **1958.** 6 tables, 11 refs. **DWB**—The success of weathe forecasting to a large extent depends on the quality of the maps showing development of th synoptic processes and on the methods used to represent the evolution of temperature an baric fields in the troposphere at a definite period of time. From the viewpoint of thei reliability, various details used in the methods, given in the 11 references for forecasting, ar evaluated. Attention is given to the evolution of the upper planetary frontal zone, horizont gradients of temperature and pressure in the middle and upper troposphere, cyclonic an anticyclonic turbulence, etc. Justification of methods used for forecasting is evaluated fo different periods of 1954–57 and the results are tabulated for correct and approximated numbe of cases. *Subject Heading:* **1. Long range forecasting.**—*N.P.S.*

12.4–207 551.509.3:551.553.

Porfir'ev, I. F., **Duet "evgei."** [The "evgei" blows.] *Meteorologiia i Gidrologiia* Leningrad, No. 4:34–35, April **1958. DWB, DLC**—The "evgei" is a very strong wind whic blows in the winter in the Ala-Kul Valley at the Dzhungarian Gates. In order to study thi wind three weather stations were established along the Druzhba road. Recently there wa reported a southeast wind of hurricane force accompanied by a snow storm with a visibility o 5 m. The wind velocity was 60 m/sec, gusts of 80 m/sec, which were recorded with an electri oscillograph. *Subject Headings:* **1. "Evgei" winds 2. Ala-Kul, Kazakh S.S.R.**—*I.L.D.*

12.4–208 551.509.312:551.515.1

Slobodov, B. Ia., **Ob uchete baroklinnosti v teorii tsentrov deĭstviia atmosfery.** [Ac counting for baroclinicity in the theory of atmospheric activity centers.] *Akademiia Nau SSSR, Izvestiia, Ser. Geofiz.,* No. 9:1420–1422, Sept. **1959.** 6 refs., 18 eqs. **DLC.** Trans into English in the corresponding number of *Akademiia Nauk SSSR, Bulletin of the Academ of Sciences, USSR, Geophysics Series.* **DLC**—Contemporary hydrodynamic investigation of the theory of the general circulation employ as fundamental equations the equation fo vertical vortex components of velocity (equation of FRIDMAN), EULER's equation along latitud

and also the equation of continuity. By taking into account the quasi-stationary character of processes of the general circulation of the atmosphere and introducing the stream function the equations of FRIDMAN and EULER become

$$\frac{\alpha\,\partial\Delta\psi'}{\partial\lambda}+2(\alpha+\omega)\frac{\partial\psi'}{\partial\lambda}=\frac{2\omega\alpha a^2}{\tilde{T}}\cos\theta\frac{\partial T'}{\partial\lambda}-\frac{2M}{\tilde{\rho}\tilde{T}}\cos\theta\frac{\partial\rho'}{\partial\lambda}$$

and

$$\frac{1}{\tilde{\rho}\sin\theta}\frac{\partial p'}{\partial\lambda}=-\alpha\frac{\partial^2\psi'}{\partial\lambda\partial\theta}+2(\alpha+\omega)\operatorname{ctg}\theta\frac{\partial\psi'}{\partial\lambda}$$

(α = index of circulation, M = temperature gradient between pole and equator for mean level, ψ', ρ', T' = deviations of stream function, pressure and temperature from their values in purely zonal circulation, $\tilde{\rho}$, $\tilde{T}$ = mean density and temperature for the mean level). The first equation is written in the form

$$\alpha\Delta\psi'+2\omega\left[1+(2M/\tilde{T})\cos^2\theta\right]\psi'=f(\theta,\lambda)$$

and its solution is demonstrated. In order to obtain results adequately simple for analysis the equation is written in the form

$$\alpha\Delta\psi'+2\omega\left[1+(M/\tilde{T})\right]\psi'=f(\theta,\lambda).$$

It is shown that in complete baroclinicity a resonance phenomenon is noted since the force of turbulent viscosity was not considered. The position of centers of activity along latitudes depend upon the value of the coefficient for $\psi'(\theta,\lambda)$; the greater the coefficient the greater is the displacement of the center of action westward. When complete baroclinicity is taken into account the number of stationary cyclones and anticyclones increases along the meridian. *Subject Headings:* **1. Centers of action 2. Baroclinicity 3. Vorticity equations 4. General circulation theories.**—*I.L.D.*

12.4–209 551.509.25:551.547

Khazova, O. N. and Chapygina, N. M., **K voprosu sostavleniia prognosticheskoĭ sredneĭ karty AT $_{500}$ na tri dnia.** [The problem of preparation of a prognostic mean AT_{500} chart for three days in advance.] *Moscow. Tsentral'nyĭ Institut Prognozov, Trudy*, 73:51–56, **1958.** 5 tables, 4 refs. **DWB**—The study and improvement of forecasting methods given in the 4 references are described in detail. Adopted criteria concern separation of the forecasting regions of the cyclonic and anticyclonic circulation in the "elementary synoptic process," for the following three days. On the basis of the data for January 1956 the forecasting charts of mean AT_{500} were prepared for 3 days of February 1957 by computation of the "vortical" velocity (Laplacian of geopotential H). The computations were repeated every day and the results were evaluated with factual data and tabulated in respect to complete and partial correctness of the forecasting. The use of described methods for preparation of forecasting charts for mean AT_{500} every day for the next 3 days found satisfactory. *Subject Headings:* **1. 500 mb prognostic charts 2. Prognostic charts 3. Extended Forecasting.**—*N.P.S.*

12.4–210 551.509.318

Egorova, V. I., **Opyt ustanovleniia granits i kharakteristik estestvennykh sinopticheskikh sezonov.** [An attempt at determining the limits and characteristics of natural synoptic seasons.] *Leningrad. Glavnaia Geofizicheskaia Observatoriia, Trudy*, No. 65(127):41–69, **1956.** 11 figs., 4 tables, 14 refs. **DLC**—Defining a synoptic season as the large scale period (macroperiod) characterized by the particular relationships of the climate forming elements of the Northern Hemisphere such as solar radiation, atmospheric circulation and the underlying surface, the author attempts to establish the factor determining the division of the year into seasons. The contents of this comprehensive study include the following: a description of the dynamics of the seasonal atmospheric circulation in the Northern Hemisphere, the characteristics of the four atmospheric circulation types established by the author. They are the dynamic properties of westerly circulation type W, of the meridional transitional form C; of the meridional circulation C and the easterly circulation E; the characteristics of the individual seasons as expressed in these circulation types; analysis of the forms of the atmos-

pheric circulation for the period 1949–1950, and variation and development of seasonal circulation forms in individual years for the period 1899–1959. Annual variations in the arrival of solar radiation and the condition of the underlying surface bring about either zonal or westerly forms of atmospheric circulation during the spring and fall and meridional and easterly during the summer and winter periods. The continuation of these processes in individual years differs and does not correspond to the limits of the astronomical and calendar seasons. There are years in which a particular seasonal variation of the atmospheric circulation is lacking. This may be explained by the phenomenon of solar activity. *Subject Headings:* **1. Natural synoptic seasons 2. Seasonal atmospheric circulation 3. Circulation types 4. Northern Hemisphere.**—*I.L.D.*

12.4–211 551.509.318:551.524.4

*Pápai, Gabriella (*Szalay*), **A szabadlégkör hőmérsékleti gradiense az alsó 500 méterben különböző makroszinoptikus helyzetekben.** [Temperature gradient of the free atmosphere in the lower 500 m during various synoptic situations.] *Időjárás*, Budapest, 63(2):105–107, March/April **1959.** 4 tables, 3 refs. **DLC**—The formation of gradients, relating to 100 m, were examined at Aerological Observatory of Budapest, on the basis of two daily radiosonde flights during 1954–1958, although there was an awareness of some heterogeneity of the data. The examinations were extended to the determination of probability of gradients reaching or surpassing the adiabatic gradient. Tables show the monthly means; the inversions and probability of gradients surpassing 1°; the seasonal means of temperature gradients in different macrosynoptic situations; finally, the percentile probability of inversions, and of gradients of 1° or more by seasons, in various macrosynoptic situations. These situations were divided into the following five groups: 1. Northward directed situations, resulting from East-European cyclones or from anticyclones originated from an anticyclone above the British Islands. 2. Southward situations, connected to West-European cyclone or to Mediterranean cyclone and East-European anticyclone. 3. Westward situations emanating from North-European cyclone, and West- or South-European anticyclone, respectively. 4. Eastward directed situations connected with North-European anticyclone. 5. Anticyclone situations, developing in the case of an anticyclone in a position above the Carpathian Basin. The references include author's research on the climate of the troposphere above Hungary. *Subject Headings:* **1. Temperature gradient 2. Synoptic conditions over Europe 3. Europe 4. Carpathian Basin, Hungary 5. Budapest, Hungary.**—*O.T.*

12.4–212 551.509.318:551.513.1

Spiridonova, Iu. V., **Smeshchenie estestvennykh sinopticheskikh raĭonov Severnogo polushariia.** [Displacement of natural synoptic regions of the Northern Hemisphere.] *Akademiia Nauk SSSR, Izvestiia, Ser. Geog.*, No. 6:94–97, Nov./Dec. **1959.** 2 figs., 4 refs. **DWB**—In order to examine the displacement of natural synoptic regions, the author determined the character and boundaries of these regions on the basis of the circulation in different parts of the Northern Hemisphere and the spatial fluctuation of circulation processes from season to season and year to year. The division of the Northern Hemisphere into natural synoptic regions was accomplished by analyzing the direction and frequency of Arctic air incursions. The winter and summer characteristics of Arctic incursions, the variation of summer and winter meridional processes and the secular variation of the frequency of meridional processes in five natural synoptic regions of the Northern Hemisphere are analyzed. In the five natural synoptic regions thus established the spatial displacement of the circulation processes from season to season and year to year is the result of the fact that the natural synoptic region is not something permanent. As a criterion of the position of the boundaries of those regions and of their fluctuation the rhythmicity of the circulation processes in different parts of the Northern Hemisphere can be used. Each of the five regions are synoptically homogeneous both in summer and winter since both are under the influence of a particular cluster of Arctic cyclones. From the circulation aspect the distinct role of the continents and oceans of the Northern Hemisphere must be considered, each of the five regions appearing synoptically homogeneous embraces a territory within which the underlying surface acts similarly upon atmospheric processes. *Subject Headings:* **1. Natural synoptic regions 2. Arctic air circulation 3. Northern Hemisphere.**—*I.L.D.*

12.4–213 551.509.52:629.13(266)

Porter, Elizabeth M., **Errors in wind forecasts on some South Pacific air routes.** *New Zealand. Meteorological Office, Technical Note*, No. 84, March 13, 1952. 2 p. 3 tables. **DWB**—A comparison is made between forecast and observed equivalent tail winds on 224 flights in the South Pacific. The standard deviation was 9 knots on the Nandi-Canton Island route and 22 knots on the Nandi-Sydney and Nandi-Auckland routes compared with 11 knots and 14 knots respectively, if published seasonal mean winds had been used as forecasts. *Subject Headings:* **1. Wind forecasting errors 2. South Pacific air routes 3. South Pacific.**—*Author's abstract.*

STRUCTURE AND PHYSICS OF THE ATMOSPHERE

ATMOSPHERIC COMPOSITION (551.510.4)

See also: **Nitrogen in atmos.** (Wilson), 12.4–180.

12.4–214 551.501.71 551.510.4:546.226:546.132

Cadle, R. D. (*Stanford Res. Inst., Calif.*), **Micrurgic identification of chloride and sulfate.** *American Geophysical Union, Geophysical Monograph*, No. 3:18–21, **1959.** 4 figs., 8 refs. **DWB, DLC**—Chemical micrurgy, combined with the more conventional methods of chemical microscopy, provides a powerful tool to identify particulate material collected from the atmosphere when little or nothing is known in advance concerning its composition. These techniques have been used at Stanford Research Institute for about eight years. The present paper reviews these methods and describes some of the applications, particularly with respect to analyses for chlorides and sulfates. Photos of Taylor micromanipulator, of positive tests obtained with the chemical micrurgic technique and of crystals from power plant burning fuel oil, observed between crossed nicol prisms, are reproduced. *Subject Headings:* **1. Chemical micrurgy 2. Chemical microscopy 3. Aerosol identification 4. Taylor micromanipulator.**—*I.S.*

12.4–215 551.510.41:546.214(436.14)

*Steinhauser, Ferdinand (*Zentralanstalt f. Met. & Geodynamik, Vienna*), **Ergebnisse von Registrierungen des Ozongehaltes der Luft in Wien.** [Results of atmospheric ozone content recordings at Vienna.] *Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. A*, Vienna, 11(3):368–382, **1959.** 3 figs., 6 tables, 6 refs., 2 eqs. German, English and French summaries p. 368. **DWB, DLC**—Since Sept. 1, 1957, continuous recordings of the ozone content of the air near the ground have been made at the Zentralanstalt für Meteorologie und Geodynamik, Vienna, according to a method given by A. Edmert. The apparatus and measuring procedure are discussed. Annual and daily variations, for all months and seasons, and for clear and overcast days are given. The variability of the amount of ozone is given in the form of frequency distributions of daily means, of midnight- and noon-readings, and of the interdiurnal variability. *Subject Headings:* **1. Ozone data 2. Ozone measurement techniques 3. Vienna, Austria.**—*Author's abstract.*

ATMOSPHERIC POLLUTION (551.510.42)

See also: **Chem. analysis of air pollutants** (Jacobs), 12.4-4; **Ragweed pollen count** (Dingle et al.), 12.4-77; **Control of industrial pollutants** (Gast), 12.4-93; **Hygroscopic particles** (Twomey), 12.4-189; **Air pollution measurement, Vienna** (Steinhauser), 12.4–204; **Turbulent atmos. diffusion and air pollution** (Pasquill), 12.4–231.

12.4–216 551.510.42:551.521.3

Mikirov, A. E., **O malykh uglakh indikatrisy rasseianiia.** [Small angles of the scattering index.] *Akademiia Nauk SSSR, Iszvestiia, Ser. Geofiz.*, No. 2:288–295, Feb. **1959.** 10 figs. (incl. photos), 11 refs., 7 eqs. **DLC**—Possible theoretical and experimental methods of solving problems of determining functions of spectrum of aerosol particles according to the light intensity included in small angles of depression indices. The lower and upper limits of the

measurement dimensions of particles are indicated. The method of measuring the scattering index for different angles involving the principle of determining the function of distribution of particles by size by K. S. Shifrin (1951) is presented. The intensity of light, scattered by N particles of radius r within an angle is measured. Then- $I(\beta_i) = \frac{r^2}{\beta_i^2}\int_0^R N(r)J_1^2\left(\frac{2\pi r}{\lambda}\beta\right)dr$ the interval (O, R) is divided into sections; and $0 \leqslant r_1 < r_2 \leqslant \cdots \leqslant r_{n-2} \leqslant \leqslant r_n = R$—points F. Then

$$I(\beta_1) = \frac{r_1}{\beta_i}\int_0^{r_1} n_1(r)J_1^2\left(\frac{2\pi r}{\lambda}\beta\right)dr + \frac{r_2}{\beta_i}\int_{r_1}^{r_2} n_2(r)J_1^2\left(\frac{2\pi r}{\lambda}\beta\right)dr + \cdots$$

and

$$I(\beta_i) = an_1(r_1)i(\beta_i r_1) + bn_2(r_2)i(\beta_i r_2) + \cdots.$$

Another method of determining the spectrum of distribution of particles is based on the following equation of light intensity scatter in the direction of angle β namely

$$I(\beta) = \frac{I_0}{\beta^2}\int_0^\infty r^2 f(r)J_1^2\left(\frac{2\pi r}{\lambda}\beta\right)dr.$$

which may be transformed into the form:

$$\varphi(\beta) = \frac{d}{d\beta}\pi\frac{I(\beta)}{I_0}\beta^3\left(\frac{2\pi}{\lambda}\right)^3 = \pi\int_0^\infty \frac{d}{d\beta}\left[\beta J_1^2(\rho\beta)\right]\rho\left\{\rho f(\rho)\right\}d\rho.$$

The integral on the right may be regarded as a generalized form of the Fourier transformation for the function $\rho f(\rho)$. It is shown that the function of distribution of particles can be determined according to the measured value $I(\beta)$. For this purpose it is necessary to obtain the function $I(\beta)$ and to construct from it the dependence upon β of the value $I\frac{(\beta)}{I_0}\beta^3\left(\frac{2\pi}{\lambda}\right)^3$ according to the curve obtained to construct the relationship $\varphi(\beta)$ and to obtain $f(\rho)$ by graphic integration. The spectrum of distribution of particles is determined by other types of functions, namely:

$$1 - F = e^{-(r/a)^k}, \qquad n(r) = Ar^2e^{-br}, \qquad n(r) = \frac{1}{\sigma\sqrt{2n}r}\,e^{-[\ln(r/r_0)^2/2\sigma^2]}.$$

An apparatus is described for obtaining the spectrum of particle distribution. *Subject Headings:* **1. Aerosol particle spectrum 2. Light intensity scattering 3. Scattering index measurements.**—*I.L.D.*

12.4–217 551.591.3:551.510.42:551.576.2

Péczely, György, **Szokatlan délelőtti sötétség Budapesten 1959. márc. 16-án.** [Unusual darkness before noon on March 16, 1959 at Budapest.] *Időjárás*, Budapest, 63(2):118–120, March/April **1959.** 3 figs., 2 tables. **DLC**—The analysis of an unusual decrease of illumination led to the conclusion that it was a result of an accumulation of air pollutants in cloudy weather. The weather situation was favorable to an accumulation of polluting materials near the surface, emanating in the early morning, from factories. The direction and speed of air current and the formation of turbulence inclination at night and in the early morning were further favorable factors. These conditions, coincident with low cloud stratum, caused an unusually dark forenoon. A weather map of that day shows an anticyclone situated NNE of Hungary, causing a moderate eastern current above the Carpathian Basin. The accumulation of air pollution and the decrease of illumination are illustrated by diagrams derived from the hourly horizontal visibility measurements of the Meteorological Institute. Measurements of the speed of air currents at 0, 12, 15 and 18 hours for 500, 1000, 1500, 2000 m altitude and of variations of visibility outside of the city, are presented on tables. The distribution of visibility above Budapest is also illustrated. *Subject Headings:* **1. Atmospheric pollution-weather relationships 2. Air current measurements 3. Visibility measurements 4. Budapest, Hungary.**—*O.T.*

12.4–218 551.515:551.510.42

Shephard, Roy J. (*Cincinnati*), **Topographic and meteorological factors influencing air pollution in Cincinnati.** *Archives of Industrial Health*, (Chic.?), 19:44–54, Jan. **1959.** 11 figs., 8 refs. **NLM, DLC**—Hourly records of suspended particulate matter have been obtained for periods of four to eight months from some 60 homes in the city of Cincinnati. Large differences in domestic concentrations were demonstrated over short distances within the city, depending on the habits of the occupants with respect to opening of windows, the relationship of the home to important sources of pollution, the wind direction, and the characteristics of the thermal inversions when these occurred. The importance of these findings in relation to air-hygiene surveys is discussed. Sootfall figures can be influenced by windblown dust, particularly at seasons when the gust velocities are high, but do give some index of urban air pollution. Owing to the higher settling velocity, less of the sootfall than of the suspended particulate matter is carried to the periphery of the city. *Subject Headings:* **1. Weather effects on atmospheric pollution 2. Atmospheric pollution variations 3. Cincinnati, Ohio.**—*Author's abstract.*

TROPOSPHERE (551.52)—STRATOSPHERE (551.53)

See also: **Physics of the atmos.** (Pokrovskaia), 12.4–33; **Heat sources of upper atmos.** (Ishikawa), 12.4–102; **Stratospheric humidity measurement** (Barclay et al.), 12.4–201; **Idealized atmos. on a flat, nonrotating planet** (Eckart), 12.4–221; **Kinetic to potential energy conversion in stratosphere** (White, Nolan), 12.4–226; **Internal friction in the lower atmos. over Sofia** (Barov, Angelov), 12.4–227; **Influence of terrain and thermal stratification on flow in surface and planetary boundary layers** (Edinger, Kao), 12.4–263; **Wind speed profiles of lowest air layer** (Yoshino), 12.4–264.

12.4–219 551.510.528:551.524.7

Orlova, E. M., **Issledovanie neperiodicheskikh kolebaniĭ vysoty tropopauzy.** [Investigation of nonperiodic fluctuations of tropopause height.] *Moscow. Tsentral'nyĭ Institut Prognozov, Trudy*, No. 70:74–86, **1958.** 3 figs., 3 tables, 4 refs., 2 eqs. **DWB, DLC**—The work is based on the hypothesis that an air layer of the tropopause of definite stratification originates and forms at one height or another as a result of temperature changes in the vertical movements and nonadiabatic heat input. The effects of these factors on fluctuation of the tropopause height were computed from temperature soundings and wind observations at levels from 850 to 100 mb. 200 curves for air stratification and 100 cases of the fluctuation of tropopause were analyzed with the charts for changes of stratification and tabulated data for different points of the European U.S.S.R. Conclusions are drawn and briefly outlined. *Subject Headings:* **1. Tropopause height variations 2. Upper air temperature effects on tropopause height 3. European U.S.S.R.**—*N.P.S.*

RADIO METEOROLOGY (551.510.62)

See: Sec. D2, p. 703; **Arctic radio wave propagation** (Owren, Little), 12.4–18; **Literature on tropospheric propagation** (Nupen, Thuronyi), 12.4–45; **Ionos. radio wave scattering** (Bailey), 12.4–127; **Volcanic influences on radio wave propagation** (Kizawa), 12.4–171; **Atmospheric limitations on electronic distance measuring equipment** (Thompson et al.), 12.4–262; **High frequency wave propagation related to eclipse** (Kanaya, Ueno), 12.4–335; **Ionization effects on propagation** (Green), 12.4–347; **Effects of ionos. and aurora on short wave radio signals** (Whale), 12.4–357.

RADIOACTIVITY (551.510.7)

See also: Sec. B6, p. 690.

12.4–220 551.510.71

†Styra, B., **Natūralaus atmosferos radioaktyvumo tyrimo problemos.** [Main problems of the investigation of natural radioactivity in the atmosphere.] *Lietuvos TSR Mokslų Akademija. Geologijos ir Geografijos Institutas, Geografinis Metraštis*, 1:125–144, **1958.** 59 refs., eqs. Russian and English summaries p. 134–142.—The author gives a review of the recent

state of research on radioactivity of the atmosphere. Material composition of atmospheric radioactivity, the question of its quantitative measurement, and the changes of radioactivity in time and space are analyzed in the article. Moreover, the circulation of radioactive materials between the earth's surface and the atmosphere and a number of meteorological phenomena, in which atmospheric radioactivity plays the role of an indicator, are discussed. *Subject Headings:* **1. Natural radioactivity in the atmosphere 2. Radioactivity-weather relationship** —*Author's abstract.*

MECHANICS AND THERMODYNAMICS OF THE ATMOSPHERE (551.511)

See also: **Height of Cu and Cb clouds, Poland** (Demianczuk), 12.4–51; **Heat sources of upper atmos.** (Ishikawa), 12.4–102; **Upper atmos. diffusion** (Mange), 12.4–145; **850 mb calculations at mt. stations, Yugoslavia** (Jurčec), 12.4–190; **Instability effect in formation of pilaeus cloud** (Sparrow), 12.4–276.

12.4–221 551.511:551.510.536 551.524.7

Eckart, Carl (*Scripps Inst. of Oceanog., La Jolla, Calif.*), **Disturbances in an idealized atmosphere on a flat planet without rotation.** *Journal of Geophysical Research*, Wash., D. C. 63(3):599–604, Sept. **1958.** 2 figs., 8 eqs. **DLC**—"Observations made within the last ten years indicate that the highest layers of the atmosphere actually do exhibit a characteristic temperature increase. It is probable that the thermosphere, as it is called, is actually a lid on the atmosphere—the thing that prevents the mechanical energy from leaking out. In an isothermal atmosphere, the pressure amplitude decreases and the velocity amplitude increases with decreasing density in such a way that the energy flow remains constant. In the non-isothermal case, both the pressure and velocity amplitudes go to zero with decreasing density. Of course, even if there were no temperature increase, the mechanical energy would be converted to thermal energy at altitudes where the wave length becomes comparable to the mean free path." *Subject Headings:* **1. Atmospheric models 2. Thermosphere.**—*From author's paper.*

12.4–222 551.511:551.571

Ferreira, H. Amorim and Peixoto, José P., **Nota sobre o transporte horizontal de vapor de água na atmosfera.** [Note on the horizontal transport of water vapor in the atmosphere.] Lisbon, Academia das Ciências de Lisbon, **1958.** 11 p. 2 figs., 2 tables, eqs. English summary p. 11. At head of t-p.: *Separata das Memòrias, Classe de Ciências*, Tomo VII. **DWB** (M71 F383no)—The horizontal transport of water vapor in the atmosphere of the Northern Hemisphere is studied in this paper by the experimental method. The quantities which describe it are the zonal flux F_x and the meridional flux F_y defined as indicated in section 2. The results of daily measurements by radioelectric means of atmospheric pressure, temperature, humidity and wind at 90 aerological stations in the Northern Hemisphere during the calendar year 1950 at 1500 G.M.T. were utilized for the computation of F_x and F_y at significant levels (surface, 1000, 850, 700 and 500 mb). The integrated values of F_x and F_y in winter (Oct.–March), summer (April–Sept.) and the year were computed for the 90 places of the basic network and plotted on hemispheric maps from which the values at the points of a basic grid 10° square were deduced. The mean values of F_x and F_y for each latitude, including 45°, were further computed (section 3). These values, expressed in grams per centimetre and per second, are given in Tables I and II, graphically represented in Fig. 1 and 2, and analysed in Sec. 4 and 5. Some comments are made in Sec. 6. There is a striking correlation between the horizontal transport of water vapor in the atmosphere and the significant features of the general circulation, namely the equatorial convergence, the subtropical anticyclones and subpolar depressions, and the annual migration of these centers of action towards the summer hemisphere. The water vapor flux across the equator is northward in April–September, southward in October–March. The tropical and subtropical zone (latitudes from 14 to 47°) which includes the desert belt in the vicinity of 27°, acts as a source of moisture. The equatorial zone (up to 14°) and the subpolar zone (from 47 to 77°) act as sinks. The water vapor flux over the polar region is directed towards the equator: the amount of precipitation is necessarily small. *Subject Headings:* **1. Water vapor transport 2. Northern Hemisphere.**—*Authors' summary.*

12.4–223 551.511:551.515.33

†Matveev, L. T. and Ziabrikov, V. A., **O kachestvennom analize uslovii vikhreobrazovaniia v atmosfere.** [Qualitative analysis of the conditions of vortex formation in the atmosphere.] *Meteorologiia i Gidrologiia*, Leningrad, No. 7:42–47, July **1958.** fig., table, 14 refs., 7 eqs. **DWB, DLC**—The authors attempt to evaluate the magnitudes of the various terms of the vortical transport equation from which qualitative forecasting rules are obtained. This equation is $d\Omega_z/d\tau = 2\omega_z/T[ug(\partial T/\partial x)+vg(\partial T/\partial y)]-\beta v_N-(2\omega_z+\Omega_z)(\partial u/\partial x+\partial v/\partial y)$. Computations of the values horizontal gradient $[-(\partial T/\partial n)]$ and advective temperature change $[-wg(\partial T/\partial x)-vg(\partial T/\partial y)]_1\beta v_N$ individual vortical variation $(d\partial/dt)_y=(1/2\omega_z P)(d\Delta P/dt)$ carried out on the basis of 46 cases of cyclogenesis are presented. The calculations show that horizontal baroclinicity plays a fundamental role in the formation and deepening of moving cyclones and cyclonic vortices form and intensify in the region of cold advection on cold fronts; the baroclinicity has the same order of magnitude as in individual variations of vortex with time. The deepening of the cyclone (dynamic fall of pressure) takes place in the rear of the cyclone, that is, in the region of cold advection. Local fall of pressure in the anterior part of the cyclone is produced almost always by advection of the cyclonic vortex. The divergence term does not play a decisive role in cyclo- and anticyclogenesis, it has only a supplementary effect, usually a weakening effect brought about by the first and second times. The author replies also to some criticism of the above presented by L. S. Gandin and A. S. Dubov in their paper **K voprosu o kachestvennom analize uravneniia vikhria** [Problem of the qualitative analysis of the vortex equation], in *Met. i Gid.* No. 4:36–37, **1957** (*see* 10.2–184, Feb. 1959, *Met. Abs.*). *Subject Headings:* **1. Vorticity equations 2. Vortex movement.**—*I.L.D.*

12.4–224 551.511.2:551.513.1

Blinova, E. N., **K teorii godovogo khoda nezonal'noĭ tsirkuliatsii atmosfery Zemli.** [The theory of annual variations in atmospheric meridional circulation.] *Akademiia Nauk SSSR. Institut Fiziki Atmosfery, Trudy*, No. 2:5–22, **1958.** 4 refs., 110 eqs. **DLC** (Slavic)—In this mathematical theoretical paper on the nonzonal circulation of the atmosphere, the author presents the hydrodynamic theory of the phenomenon by proceeding from a given distribution of continents and oceans and a given annual variation of the influx of heat from the sun, taking into account long wave radiation and heat conductivity. The solution is achieved by means of linearizing the equations of hydrodynamics and thermodynamics in relation to west-east transport. The application of this work to a theory of climate is discussed. *Subject Headings:* **1. Meridional circulation theories 2. Annual meridional circulation.**—*I.L.D.*

12.4–225 551.511.2:551.513.1:551.509.318

Mashkovich, S. A., **Teoreticheskaia model' dlia izucheniia formirovaniia obshcheĭ tsirkuliatsii atmosfery i klimaticheskikh poleĭ meteoelementov.** [Theoretical model for the study of the formation of the general atmospheric circulation and climatic fields of meteorological elements.] *Moscow. Tsentral'nyĭ Institut Prognozov, Trudy*, 78:37–63, **1958.** 11 refs., 95 eqs. **DWB**—The author presents a solution of the nonlinear problem on the development of large scale processes in the atmosphere during any initial distribution of the meteorological elements in the temporal variations of incoming solar heat. The problem is treated as the motion of a compressible fluid over a spherical earth: a system of spherical coordinates associated with the rotating earth is used. The solution of the problem involves the use of the equations of motion, continuity, heat advection, transport of radiant energy, heat conductivity in the underlying environment, distribution of humidity and of state. Equations for computing the variation of energy are developed by using equations describing the variation of kinetic and potential energy in the atmosphere. *Subject Headings:* **1. Atmospheric circulation models 2. Climatic fields 3. Forecasting circulation types.**—*I.L.D.*

12.4–226 551.511.2:551.510.53

White, Robert M. (*Travelers Ins. Co., Hartford, Conn.*) and Nolan, George F. (*M. I. T.*), **A preliminary study of the potential to kinetic energy conversion process in the stratosphere.** *Tellus*, Stockholm, 12(2):145–148, May **1960** 2 figs., table, 4 refs., 4 eqs. **DWB, DLC**—The potential to kinetic energy conversion process in the lower stratosphere associated with the

vertical exchange of warm and cold air is evaluated using adiabatically derived vertical velocities for the North American region for a five-day period. Preliminary results suggest the possibility that on the average the kinetic energy of stratospheric motions may not result from a conversion of potential energy within the stratosphere by this process. The further implication is that stratospheric motions are maintained by the motions in the adjacent layers of the atmosphere. *Subject Headings:* **1. Energy conversions 2. Stratospheric motions.**—*Authors' abstract.*

12.4–227 551.511.32:551.510.52

*Barov, Varvari B. and Angelov, A., **Opit za empirichno opredeliane na vŭtreshnoto triene na vŭzdukha v trikilometroviia prizemen atmosferen plast nad Sofiĭsko.** [An attempt to determine empirically the internal friction of the air in the lowest three kilometers of the atmosphere over the Sofia region.] *Khidrologiia i Meteorologiia*, Sofia, No. 4:58–68, **1958.** 3 figs., 5 tables, 7 refs., 16 eqs. Russian and English summaries p. 66–68. **DLC**—On the basis of pilot balloon data for Sofia (Boiurishte) for 1925–1945, the average wind velocities at 500 m intervals are tabulated, presented graphically and expressed in an equation. The data are analyzed and the coefficient of internal friction is derived. It is found that the coefficient of internal friction in the first 3 kilometers of the atmosphere appears to be a linear function of the geostrophic wind, within certain limits of the geostrophic wind value. *Subject Headings:* **1. Coefficient of internal friction 2. Geostrophic wind analysis 3. Sofia, Bulgaria.**—*From authors' abstract.*

12.4–228 551.511.33:551.576.11:551.577.11

Dinkelacker, Otto (*Wetteramt, Stuttgart*), **Die Grundlagen der Thermodynamik und ihre Bedeutung für die Wolken- und Niederschlagsbildung.** [The fundamentals of thermodynamics and their importance in cloud and precipitation formation.] *Zeitschrift für Meteorologie*, Berlin, 12(4/6):158–162, April/June 1958. fig., 22 eqs. **DWB, DLC**—The author demonstrates that the foundation of thermodynamics of the atmosphere can be obtained only with the aid of the energy principle, that is the first law of thermodynamics. The general energy equation for an adiabatic motion is set up by taking into account the enthalpic, geopotential and kinetic energy changes and the accompanying heat of condensation or evaporation. For the adiabatic displacement of a parcel of air in the pre-condensation stage from one geopotential surface to the adjoining one there is obtained the differential equation:

$$d\epsilon_1 + m \cdot d\epsilon_d + w \cdot d\epsilon_\omega + dh_d + \omega \cdot dh_\omega + l \cdot dm(1 + m + \omega)_1 u_1 dv = 0.$$

From this are derived the laws of BERNOULLI-BJERKNES and DIETRICH-SONNTAG. In the condensation processes the equations of CLAPEYRON-CLAUSIUS and KIRCHHOFF are used. Also the individual adiabats, namely dry, cloud and vapor adiabats are derived. *Subject Headings:* **1. Thermodynamics of the atmosphere 2. Precipitation formation 3. Cloud formation.**—*I.L.D.*

12.4–229 551.511.33:551.513.1:551.557.2

†Rakipova, L. R., **Issledovaniia perenosa momenta kolichestva dvizheniia v atmosfere.** [Research on the transfer of angular momentum in the atmosphere.] *Meteorologiia i Gidrologiia*, Leningrad, No. 11:56–61, **1958.** 4 figs., 50 refs. **DWB, DLC**—On the basis of an extensive review of the Soviet and foreign literature on the transport of angular momentum, the author discusses the dimensions of the deviation of zonal wind at the 200–300 mb level from the theoretical value determined by the condition of constant angular momentum. The following subjects have also been discussed: constancy of the total angular momentum of the rotating system atmosphere-earth; the fundamental role of surface friction in altering the absolute angular momentum of different zones of the atmosphere; the role of turbulent transport-exchange of equal masses having unequal angular momentum as a result of large scale vortices and the regular transport of air masses in the lower layers of the atmosphere toward the equator and in the upper layers toward the poles at given latitudes, balance of angular momentum in the atmosphere and the use of angular momentum calculations in explaining temporal and local characteristics of the general circulation. *Subject Headings:* **1. Angular momentum transfer 2. Atmospheric circulation 3. Zonal winds.**—*I.L.D.*

12.4–230 551.511.33

Wachter, H., **Bemerkungen über die Höhenverteilung des atmosphärischen Umsatzes latenter Wärme.** [Remarks on the height distribution of the atmospheric latent heat exchange.] *Frankfurt a.M. Universität. Meteorologisch-Geophysikalisches Institut, Bericht*, No. 6:78–82, **1956.** 7 refs. **DWB?**—An attempt is made to compare the height distribution of condensation heat computed by Möller, Defant, and Albrecht with the mass and energy balance of thunderstorms calculated by Braham. It was found that Braham's distribution extends into the negative in lower strata (800 mb); in these strata heat is removed from air by the dissolution of precipitation elements and is stored as latent heat in water vapor. On the other hand, according to Möller, condensation heat can never attain negative values, this cannot be said for individual processes. The great height attained by cumulonimbus clouds in Braham's measurements as compared with that of other authors is attributed to the subtropical troposphere in which the experiments were conducted. The condensation heat energy according to the mean value curves of Möller and Defant is 0.02 W/m^3, the C_b curve of Albrecht is 0.4 W/m^3 and the C_b curve of Braham is 2 W/m^3. *Subject Headings:* **1. Latent heat exchange 2. Condensation heat energy.**—*I.L.D.*

12.4–231 551.511.6:551.510.42:061.3

Pasquill, F., **Atmospheric diffusion and air pollution.** *Nature*, London, 182(4643): 1134–1136, Oct. 25, **1958. DWB**—Nearly 40 papers were read before the International Symposium on Atmospheric Diffusion and Air Pollution at Oxford, Aug. 24–29, 1958 where about 100 meteorologists and fluid dynamicists from different countries met to discuss the physics of turbulent atmospheric diffusion as applied to air pollution problems. Several sessions discussed such specific aspects of the problem as the structure of atmospheric turbulence, diffusion of particles, vertical atmospheric transfer on all scales in the atmosphere and the effect of thermal stratification thereon, and the distribution of airborne material, including radioactive fallout. The author comments on some of the major issues brought out in the proceedings. *Subject Headings:* **1. Atmospheric diffusion 2. Atmospheric pollution.**—*W.N.*

12.4–232 551.511.6:532.517.4

Reid, W. H. (*Brown Univ., Rhode Island*) and Harris, D. L. (*David Taylor Model Basin, Wash., D. C.*), **Similarity spectra in isotropic turbulence.** *Physics of Fluids*, N. Y., 2(2): 139–146, March/April **1959.** 7 figs., table, 12 refs., 76 eqs. **DWB**—Similarity solutions are given for the energy spectrum and transfer function in the initial period of decay for a range of values of the Reynolds number using the transfer theory suggested by Kovasznay. Because of the simple form of the theory, the solution can be obtained in closed form for all values of the Reynolds number, and this exact solution is useful for analytical purposes. To obtain detailed results, however, it is more convenient to employ numerical methods. It is found, for example, that the skewness factor S of $-\partial u_1/\partial x_1$ varies only between 3.93 K_K for $R_\lambda = 0$ and 2.86 K_K for $R_\lambda = \infty$, where K_K is the arbitrary constant that occurs in the theory. A comparison between the present results and those obtained by using Heisenberg's transfer formula is also made. Some results for the transfer function in the final period of decay are also given. *Subject Headings:* **1. Isotropic turbulence 2. Physics of fluids.**—*Authors' abstract.*

12.4–233 539.16:546.57:546.15:551.511.6

Sänger, R. and Carreras, R. (*both Zurich*), **De l'utilisation d'iodure d'argent radioactif pour l'étude de sa diffusion dans l'atmosphère.** [Use of radioactive silver iodide for the study of its diffusion in the atmosphere.] *Schweizerische Naturforschende Gesellschaft, Geneva, Verhandlungen*, 138:103–104, **1958.** 3 refs. **DLC** (Q67.S4).—A procedure is described to detect silver iodide in the atmosphere in three stages: filtration of air on asbestos paper presents measurability of iodide activity on the filter by chemical separation, by reduction of the sample to a minimum volume, and by autoradiography on the nuclear plate. The chemical separation isolates the radioactivity of the iode from numerous other radioactive products found in the air, by transforming AgI into soluble NaI, then NaI into AgI. By dissolving the sodium iodure in acetone the radioactivity of a half-score of cubic meters of air becomes concentrated and isolated into some cubic centimeters of an acetone solution. The silver iodide will be concentrated by evaporation into a disc of one mm diameter, ready for the measurement of

its proper activity. The disc placed onto a nuclear emulsion (ILFORD/G5) yields an autoradiographic picture. Its tracings are counted by microscope. The data obtained from several points permit to calculate the concentration of silver iodide contained in the atmosphere at points where it is too weak to be detected otherwise than by its meteorological effects. *Subject Headings:* **1. Radioactive tracers 2. Silver iodide tracers 3. Atmospheric diffusion studies.** —*O.T.*

GENERAL CIRCULATION (551.513)

See also: **Antarctic atmos. circulation** (Tauber), 12.4–29; **Arctic air circulation effects on displacement of natural synoptic regions** (Spiridonova), 12.4–212; **Meridional circulation variations** (Blinova), 12.4 224; **Atmos. circulation and climatic fields of met. elements** (Mashkovich), 12.4–225; **Transfer of angular momentum in the atmos.** (Rakipova), 12.4–229; **Topographic perturbation of a zonal current** (Oi), 12.4–324.

12.4–234 551.513.2:517.3

†Bagrov, N. A., **Analiticheskoe predstavlenie poleĭ.** [Analytical representation of fields.] *Moscow. Tsentral'nyĭ Institut Prognozov, Trudy*, No. 64:3–25, **1958.** 3 figs., 2 tables, 12 refs., 33 eqs. **DLC**—The most suitable means for describing the characteristics of the circulation over a bounded area is the resolution of the fields into integral algebraic polynomials or curves of the second, third and higher order. In spite of its simplicity and the comparatively small number of terms of the series this method has several defects, namely, its artificiality, its nonconformity to natural spherical coordinates, and the impossibility of extrapolating the analyses beyond the limits of the area for which the resolution was made. The best method for solving the system of equations with many unknowns is that of employing the Chebyshev orthogonal polynomial. Both the theory and the procedure of resolving fields by means of these polynomials are the subject of this paper. The author begins with a undimensional case, the problem being fully analogous to a problem of regression analysis, so that several statistical characteristics of correspondence of the analysis to the initial data can be obtained. The amount of cloudiness is analyzed according to Chebyshev polynomials where the independent variable is the latitude of a locality. Also the analysis of a AT_{500} field for July 1, 1953 by means of Chebyshev polynomials is illustrated. Tables giving the standard polynomials (Chebyshev number) and composite polynomials are presented. *Subject Headings:* **1. Pressure field analysis 2. Circulation characteristics 3. Cloudiness analysis 4. Mathematical techniques.**—*I.L.D.*

12.4–235 551.513.2:551.557:551.553.21

*Barbé, G. D., **Circulations atmosphériques à haute altitude: étude expérimentale de la mousson stratosphérique.** [High altitude atmospheric circulations: experimental study of the stratospheric monsoon.] *La Météorologie*, Paris, Ser. 4, No. 56:275–302, Oct./Dec. **1959.** 14 figs., 7 tables, 7 refs. French, English and Spanish summaries p. 275–276. **DWB**—Based on numerous soundings (more than 2200 of which exceeded the altitude of 20 km) since Oct. 1956, the results point out the character of the atmospheric circulation in the interior of the layer situated between the altitude of 15 and 30/35 km. The soundings were performed with a 10 cm wavelength automatic tracking radar, of which the error is less than 10 km/h regarding the force and less than 10° for direction. The method used for computation is explained. The mean atmospheric circulation at high altitudes shows between the latitude ±20° and pole: 1) a discontinuity surface at an altitude of about 18/20 km; 2) westerly winds in all seasons though stronger in winter, between 0 and 20 km; 3) winds from the W-sector in winter and from the E-sector in summer, higher than 20 km altitude. The author takes into account the conditions of "stratospheric monsoon" applicable to the circulation above the 18 km level. A pronounced seasonal variation is noted: usually the wind direction reverses from W to E during the month of May and from E to W in September; although "abnormal" years like 1959 also intervene. The altitude above which such a reversal takes place lies between 18 and 20 km. This altitude corresponds to a minimum wind velocity; the minimum is particularly pronounced in autumn, in spring and in summer. The maximum force of the higher stratospheric monsoon between 25 and 30/35 km altitude is minimum in summer, of the order of 70 km/h and maximum in winter when it can exceed 300 km/h. The

higher stratospheric circulation has a zonal character which increases with the altitude. The winter months, January and February, however are to a certain extent exceptions to this rule. The stratospheric monsoon shows also a pronounced day to day variability. This variability, i.e. the average frequency, is less than the variability of the circulation between 0 and 15 km of altitude. That is why there exists in winter between 25 and 30/35 km altitude strong winds from the E-sector and light winds from the W-sector. The latter has a velocity of less than 30 km/h which includes at an interval of few days, strong winds from the same direction, veritable "stratospheric jets" whose velocity can exceed 300 km/h. On a time scale ranging from a few minutes to several hours, the stratospheric monsoon variability is generally weak, and there turbulence only plays a very negligible role. After this study it seems that the existence of action centers at high altitudes must be admitted: anticyclones and depressions which move or develop and probably move and develop at the same time. *Subject Headings:* **1. Upper air circulation 2. Upper air winds 3. Stratospheric monsoons 4. Monsoon fluctuations.**—*A.V.*

12.4–236 551.513.2:551.43

Chao, Jih-ping (*Inst. of Geophysics and Met., Academia Sinica*), **On the dynamics of orographically produced finite perturbations in baroclinic westerlies.** *Acta Meteorologica Sinica*, Peking, 28(4):303–314, **1957.** 4 figs., 12 refs., 45 eqs. In Chinese; English summary p. 314. **DLC**—It is shown that the large-scale orographically produced perturbations in a frictionless, adiabatic and baroclinic atmosphere can be described by a three dimensional Helmholtz's differential equation. The perturbations of westerlies due to the Tibetan Plateau and Rocky Mountains are computed. The numerical results show that the positions of troughs and ridges in the westerlies are well in agreement with the observation, but there is discrepancy in intensity. The perturbations are damped rapidly with increasing height. *Subject Headings:* **1. Westerly circulation 2. Perturbation equations 3. Baroclinic disturbances 4. Orographic effects on atmospheric circulation 5. Tibetan Plateau, Tibet 6. Rocky Mts.**—*Author's abstract.*

12.4–237 551.513.2:551.557.5:551.542.1

Faust, H. (*Offenbach*), **Die Beziehungen zwischen Luftdruckfeld und Wind.** [Relation between the air pressure field and wind.] *Naturwissenschaftliche Rundschau*, Stuttgart, 11(8):317–318, Aug. **1958. DWB, DLC**—The author reviews H. Flohn's paper **Luftmassen, Fronten und Strahlströme** (*Meteorologische Rundschau* 11(1):7–13, **1958**; (*see* 10.4–177, April, **1959,** *Met. Abs.*) which is concerned with the problem of supergradient winds that manifest a flow component from low to high pressure. In this paper Flohn sees no progress in overcoming the physical objections to this concept by means of atmospheric dynamics. He suggests the abandonment of the gradient wind concept, since the equilibrium considerations are only approximations while the actual weather process is nonstationary and, therefore, requires a concept of nonequilibrium. Flohn speaks of the priority of the wind field whereby he understands the need for more intensive wind measurements in the free atmosphere. *Subject Headings:* **1. Jet stream studies 2. Pressure fields 3. Supergradient winds 4. Gradient winds 5. Wind field theories. I. Flohn, H.**—*I.L.D.*

ATMOSPHERIC DISTURBANCES (551.515)

See also: **Frontogenesis** (Gubin), 12.4–8; **Weather effects on atmos. pollution, Cincinnati** (Shephard), 12.4–218; **Vortex movement** (Matveev), 12.4–223; **Aerological conditions in front of squall lines, Eq. Africa** (Tschirhart), 12.4–265; **Profiles of wind velocity in tropical cyclones** (Jordan), 12.4–266; **Northern Hemisphere air masses** (Brunnschweiler), 12.4–312; **Air masses, Central America** (Portig), 12.4–331; **Polar front as a climatic factor** (Sementsova), 12.4–332.

12.4–238 551.515.2:551.577.37(691)

Madagascar. Service Météorologique, **Les cyclones de 1959.** [The cyclones in 1959.] *Bulletin de Madagascar*, Tananarive, 9(155):343–372, April **1959.** 5 figs.—Day by day report of the tragic events in Madagascar during the months of Feb. and March 1959. Evolution of the various cyclones which raged on Madagascar during this period and the damage caused

by the pouring rains and the cyclones are described. *Subject Headings:* **1. Tropical cyclones 2. Excessive rainfall 3. Madagascar.**—*A.V.*

12.4–239 551.515.2:551.577.37:551.579.4(691)

Perturbations cycloniques à Madagascar. [Cyclonic disturbances in Madagascar.] *Bulletin de Madagascar*, Tananarive, 9(159):665–679, Aug. **1959.** 3 figs.—Report relating to the cyclonic disturbances in Madagascar during December 1958 and January 1959 and to six cyclones which devasted Madagascar from February to April 1959. The development and displacement of these six cyclones are described and the atmospheric situations were taken into consideration. Charts show the paths of the cyclones over the Indian Ocean and the regions where the wind speed exceeded 26 m/sec. A review is given of floods and damage caused by these cyclones. In some places 450 mm of water was measured in 24 hours. *Subject Headings:* **1. Cyclone damage reports 2. Floods 3. Rainfall intensities 4. Madagascar.** —*A.V.*

12.4–240 551.515.3:551.556.1(775)

Hall, W. Ferguson and Brewer, Robert D. (*U. S. W. B., Wash.*), **A sequence of tornado damage patterns.** *Monthly Weather Review*, Wash., D. C., 87(6):207–216, June **1959.** 10 figs., 2 refs. **DWB**—An investigation is made of the patterns of damage associated with a series of tornadoes in west-central Wisconsin on June 4, 1958. Three flow models are presented to account for the different patterns exhibited in different portions of the paths. *Subject Headings:* **1. Tornado damage patterns 2. Wisconsin.**—*Authors' abstract.*

RADIATION AND TEMPERATURE

RADIATION (551.521)

See also: Sec. D1, p. 701; **Radiation data, Roi Baudouin,** 12.4-26; **Solar corpuscular radiation** (Ishikawa), 12.4–102; **Solar radio radiation** (Coates), 12.4–113; **Corpuscular radiation** (Bobrov), 12.4–154; **Magnetic effects on particle radiation** (Dessler), 12.4–157; **Van Allen radiation** (Kellogg), 12.4–158; **Van Allen belts** (Lovell), 12.4–159; **Geomagnetically trapped corpuscular radiation** (Van Allen), 12.4–160; **Albedo of glaciers** (Jaffé), 12.4–182; **850 mb calculations at mt. stations, Yugoslavia** (Jurčec), 12.4–190; **Solar radiation measurement** (Volz), 12.4–198; **Scattering index measurements** (Mikirov), 12.4–216; **Velocity dispersion of corpuscular streams** (Bagariatskiĭ), 12.4–355.

12.4–241 551.521.1:551.506(437)

*Pícha, Jaroslav, **Globální záření v Hradci Králové.** [Global radiation at Hradec Králové.] *Meteorologické Zprávy*, Prague, 12(5):97–101, **1959.** 5 figs., 6 tables, 4 refs. Russian and French summaries p. 97. **DWB, DLC**—The results of measurement of global radiation by Robitzsch pyranograph at Hradec Králové meteorological station are given. They include general climatic conclusions, the maxima and minima and frequency distribution of daily totals of radiation. *Subject Headings:* **1. Global radiation data 2. Hradec Králové, Czechoslovakia.**—*J.N.*

12.4–242 551.521.18:551.578.1:551.521.3:551.593.54

*Penndorf, R., **Results of an approximation method to the Mie theory for colloidal spheres.** Avco Corp. Research and Advanced Development Div., Wilmington, Mass., Contract AF 19(604)-5743, (Research on aerosol scattering in the infrared), Scientific Report, No. 1, Sept. **1959.** 45 p. 9 figs., 2 tables, 11 refs., eqs. (15 p. tables in appendix.)—An approximation method is outlined for computing the total Mie scattering coefficient K in aerosols using infrared light sources. The method is valid for any size parameter a, from small to very large spheres, and any arbitrary real refractive index $n \leq 2$. Analytical expressions are developed for the phase and the amplitude of K at the maxima and minima. The constants in these analytical expressions are determined from existing data computed by the exact Mie theory. Finally, a graphical interpolation process allows for determination of K for any arbitrary size. This method leads to an accuracy of ± 2 or 3 percent for K as compared with results obtained

by the Mie theory. This approximation method is then applied to 14 refractive indices n between 1.05 and 2.0. The results for smoothed $\bar{K}$ values are listed for the range $a=0.2$ (0.2) 30(0.5)40, which is considered sufficient for most applications. For very large spheres, the laws of geometrical optics can be used successfully. Graphical representations of all cases are also included. From these figures, the appropriate $\bar{K}$ value can be read off directly for any given size parameter, and also for any given radius of the aerosol particle, if the wave length of the incoming infrared radiation is selected. *Subject Headings:* **1. Infrared research 2. Aerosol scattering 3. Mie scattering theory 4. Colloidal spheres.** —*Author's abstract.*

12.4–243 551.521.18

Pierce, A. Keith (*McMath-Hulbert Obs., Univ. of Michigan*), **Solar energy distribution in visible and infrared.** (In: Conference on the Use of Solar Energy, Univ. of Arizona, 1955, **Transactions,** pub. **1958.** Vol. 1:74–84. 6 figs., 11 refs.) **DWB** —A discussion of the calibration of the spectral response of the equipment by use of duplicate instruments and blackbody standards is given. A pyrometric arc at 2200 to 2800°K is required to reduce the brightness difference between the sun and standard source. The extrapolation of solar observations to an extraterrestrial value by Langley's method has given a satisfactory accuracy of 0.25% unde r stable atmospheric conditions. Solar energy distribution and its relation to the physical conditions of the sun are presented. *Subject Headings:* **1. Solar energy distribution 2. Solar energy spectrum.**—*From author's abstract.*

12.4–244 551.521.67:551.510.71

Armour Research Foundation (*Ill. Inst. of Tech.*), **Investigation of solar gamma ray.** Contract AF 19(604)-1499, Final Report, June 23, **1958.** 41 p. 14 figs. (incl. photos), table. **DWB** (M21.9 A753in)—In order to determine whether proton induced nuclear reactions take place on the surface of the sun, an experiment has been performed to establish the existence of a capture gamma ray produced in one of the interactions. In the capture of neutrons by hydrogen, deuterium and a 2.23 mev gamma ray are formed and it is the detection of this specific gamma ray in the earth's upper atmosphere that is being used in an attempt to determine the presence of the reaction. Lack of astronomical information has placed an upper limit of 1×10^{-4} on the deuterium to hydrogen ratio in the solar atmosphere. In a measurement made at 92,000 feet during normal solar conditions, the cosmic ray spectrum shows no increase in intensity at 2.23 mev. Additional balloon flights are planned and will be made during more active solar conditions. *Subject Headings:* **1. Solar neutrons 2. Radioactivity due to solar neutrons 3. Nuclear reactions on the sun.**—*Author's abstract.*

12.4–245 551.521.67:535.24:523.755

Nikol'skiĭ, G. M., **Fotometriia koronal'nykh lucheĭ i korpuskuliarnye potoki.** [Photometry of coronal rays and corpuscular currents.] (In: Akademiia Nauk SSSR. **Komissiia po Issledovaniiu Solntsa, Fizika solnechnykh korpuskuliarnykh potokov i ikh vozdeĭstvie na verkhniuiu atmosferu Zemli.** Moscow, **1957.** p. 61–68. fig., 3 tables, 11 refs., 14 eqs.) **DLC** (QB531.A5)—The nature of the coronal rays (of the sun), their photometry, the extreme irregularity of the rays, and the results of measurements with respect to time of life of bursts, speed of corpuscles, background radiation and method of calculation, diffusion of background and of corpuscular currents, stability of currents, etc. are discussed. *Subject Headings:* **1. Corpuscular emissions from sun 2. Photometry of solar corona.**—*M.R.*

12.4–246 551.521.67:621.396.8 523.745

Oslo. Universitet. Institute of Theoretical Astrophysics, **Studies in the general field of the interrelation of solar radiation in the optical and meterwave regions with other solar phenomena and phenomena taking place in the terrestrial atmosphere.** Contract AF 61(514)-651-C, Technical (i.e. Scientific) and Final Report, Jan 21, **1957.** 34 p. 3 figs. **DWB** (523 082sc)—A report on research carried out during July 1954 to December 1955 at Oslo Observatory at Harestua, Norway, on the observations of solar radio noise (at 200 Mc/S), the use of the Burst Analysis receiver and triple element interferometer for 200 Mc/S, observations at 55 and 500 Mc/S. It contains discussion of sunspot magnetism (magnetic buoyancy

effect, solar toroidal magnetic field, the magnetic field of sunspots and the Evershed effect, and short period variations in sunspot magnetic fields), and the geometric structure of sunspot. The report also describes research on prominences and flares, filter observations of same, and discusses a theory of quiet sun origin of cosmic rays and solar terrestrial relations. *Subject Headings:* 1. Solar radio frequency radiation studies 2. Solar magnetic fields 3. Harestua, Norway.—*M.R.*

12.4–247 551.521.67:523.75

Petukhov, V. A., **Ob opredelenii skorosteĭ korpuskul, vybrasyvaemykh iz aktivnykh oblasteĭ Solntsa, po vremeni zapazdyvaniia iavleniĭ na Zemle.** [Determination of the velocity of corpuscles released from the active regions of the sun from the time lag of the phenomena at the earth.] *Akademiia Nauk SSSR, Izvestiia, Ser. Geofiz.*, No. 1; 124, **1957. DLC.** Transl. into English by W. J. King in **Izvestiia,** *Bulletin of the Academy of Sciences of the USSR, Geophysics Series*, No. 1:143, **1957,** issued 1957 by American Geophysical Union.—From the author's point of view, the mechanism of production of origin of solar corpuscles derives its energy from thermonuclear reactions arising as the result of the mixing of internal solar regions with increased concentration of lithium and hydrogen. The calculation of outwardly expelled stream relative to the rotation of the sun assumes that the axis of current cannot coincide with radial direction and hence the moment of passage of the solar spot through the central meridian cannot serve as the beginning of the reckoning of time. The lag of rotations of the outer solar layers leads to a situation in which the earth will find itself in a later moment of time or prolongation of the axis of the corpuscular stream. The comparison of ten corpuscular velocities obtained from a lag in τ and from the Doppler effect for the hydrogen atom in the region of the aurora provides a measure of the variations in angular velocities of rotations of an external and internal solar masses. *Subject Heading:* 1 **Solar corpuscules 2. Solar corpuscular velocities.**—*I.L.D.*

12.4–248 551.521.67 523.75:551.593.9

Vsekhsviatskiĭ, S. K.; Ponomarev, E. A.; Nikol'skiĭ, G. M. and Cherednichenko, V. I., **O korpuskuliarnom solnechnom izluchenii.** [Solar corpuscular radiation.] (In: Akademiia Nauk SSSR. **Komissiia po Issledovaniiu Solntsa, Fizika solnechnykh korpuskuliarnykh potokov i ikh vozdeĭstvie na verkhniuiu atmosferu zemli.** Moscow, **1957.** p. 51–58. 4 figs.) **DLC** (QB531.A5)—Coronal photographs made on June 19, 1936, Feb. 25, 1952 and June 30, 1954, with a standard coronograph in the Urals, a 2-m coronograph in Chile, and a 10-m coronograph at Kozel'ts, respectively, are shown and the results of measurements showing the relation between the electron concentration in the solar corona and that in the zodiacal light, according to different authors, presented graphically and discussed quantitatively. The extremely rapid attenuation of the corpuscular currents is emphasized. *Subject Headings:* **1. Solar corpuscular currents 2. Coronograph observations 3. Urals, U.S.S.R. 4. Chile.** —*M.R.*

TEMPERATURE (551.524)

See also: **Use of surface temperatures in jet flight planning** (Harrison), 12.4–47; **Tree trunk temps.** (Fuss), 12.4-69; **Severe winters** (Hader), 12.4–92; **Temp. effects on strength of wood** (Sulzberger), 12.4–97; **Thermodynamic wet bulb temp.** (Dufour), 12.4–202; **Temp. gradient in lower 500 m** (Pápai), 12.4–211; **Upper air temp. effects on tropopause height** (Orlova), 12.4–219; **Upper atmos. temp.** (Eckart), 12.4–221; **Influence of snow cover on heat flow from the ground** (Gold), 12.4–258; **Influence of terrain and thermal stratification on flow in surface and planetary boundary layers** (Edinger, Kao), 12.4-263; **Late spring and early fall low temps., Texas** (Blood, Hildreth), 12.4–302; **Temp. variations, U. S.** (Landsberg), 12.4–308; **Annual cycle of birthrates** (Otto, Reissig), 12.4–318; **Fluctuation in continentality, Argentina** (Diaz), 12.4–322; **Temp. changes during total eclipse, Scandinavia** (Spinnangar), 12.4–336.

12.4–249 551.324.24:551.524.3:551.553(491.1)

Ashwell, I. Y. and Hannell, F. G., **Wind and temperature variations at the edge of an ice-cap.** Meteorological Magazine, London, 89(1050):17–24, Jan. **1960.** 3 figs., 2 tables, 4 refs. **DWB, DLC**—In a previous paper the fluctuations in temperature and humidity, which were recorded

over that portion of the central desert lying immediately to the south of Langjökull, Iceland, were associated with changes of air flow in the area of the ice cap edge. The present paper presents a brief examination of wind and temperature variations on the ice cap under similar weather conditions. At four stations hourly observations were undertaken, both by day and by night, from Aug. 10 to 16, 1956. The cloudless skies and northerly winds which persisted throughout this period provided conditions which were in every respect comparable to those under which observations were made at stations located to the south of the ice cap. The present study, extensively illustrated, examines the records of this period and illustrates the extent to which meteorological events on the southern slopes of Langjökull and its surrounding deserts are interdependent. *Subject Headings:* **1. Wind variations on ice cap 2. Temperature variations on ice cap 3. Glacier investigations 4. Iceland.**—*I.S.*

12.4–250 523.746:551.524.31/2(47)

Pokrovskaia, T. V., **O vozdeĭstvii solnechnoĭ aktivnosti na rezhim temperatury v SSSR.** [Effect of solar activity upon the temperature regime of the U.S.S.R.] *Leningrad. Glavnaia Geofizicheskaia Observatoriia, Trudy*, No. 65(127):8–18, **1956.** 5 figs., 2 tables, 8 refs., 5 eqs. **DLC**—The results of an elementary statistical analysis of the relationship between the monthly and daily atmospheric temperatures over the U.S.S.R. and the index of solar activity as represented by annual and monthly values of the Wolf numbers, are presented. Each of the 11-year solar cycles was divided into four groups corresponding to the phases of maximum, minimum, ascending and descending branches of the cycles. The frequency of monthly mean temperatures were computed for each group, since for the most characteristic cases the nonrandomness of differences can be verified by statistical criteria. Similar results were obtained when the analysis was on the basis of its Wolf number. Curves for minimum and maximum values of Wolf number were similar, since the distribution of temperature was close to the normal in both; for intermediate Wolf number the distribution differed markedly from normal. In the grouping according to phase, the maximum phase was close to the minimum phase and the ascending close to the descending with regard to distribution of temperature. The deviations of the monthly mean temperatures from the normal according to phases of the solar cycle showed distinct characteristics in each phase. The absolute values of deviations from the normal and their amplitudes were not large, but a computation of the mean square errors of the amplitude indicated that the characteristics of the curves were not random. The deviation of the mean monthly temperature from the normal during the solar phases and the relationship of the deviations of daily temperatures from the normal for calendar dates, or singularities was investigated statistically by means of the correlation ratio. In the case of monthly mean temperatures grouped into 4 phases for 11 points in the U.S.S.R., the correlation ratio was between 0.1 and 0.2 with a maximum of 0.6. For the singularities correlation ratios of temperature characteristics with dates ranged from $+0.11\pm0.03$ to 0.716 ± 0.25. In general rather close heliogeophysical relationships have been established between specific phases of solar activity and individual months or regions of the earth; the heliogeophysical relationships are not constant, their quantitative indices and their presence vary from epoch to epoch. *Subject Headings:* **1. Temperature regime 2. Wolf number 3. Heliogeophysics 4. U.S.S.R.**—*I.L.D.*

12.4–251 551.524.36:628.8(52)

*Kubo, J., **Normal heating degree days.** *Journal of Meteorological Research*, Tokyo, 11(5):387–390, May **1959.** 3 figs., 2 tables, 7 refs., 10 eqs. In Japanese; English summary p. 387. **DWB, DLC**—H. C. S. Thom, U. S. Weather Bureau, reported a method of estimating normal heating degree-days before any limit temp. from available monthly data. On examining Thom's method for the daily and monthly data of Tokyo for 1921–1950, the author has found that the method is successfully applicable in Japan. For Tokyo, the author has compared normal heating degree-days calculated by the following methods with each other: (1) limit temp. minus daily mean temp. of every year; (2) limit temp. minus normal daily mean temp.; (3) limit temp. minus normal monthly mean temp.; (4) Thom's method. Results obtained are shown in Table 2, from which we can easily find that Thom's method produces a normal value more pertinent than those obtained by methods (2) and (3). *Subject Headings:* **1. Heating degree-day data 2. Japan.**—*Author's summary.*

12.4–252 551.524.36(99)

Rubin, Morton J. [*(U. S. W. B.) Soviet IGY Antarctic Expedition, Mirny, Antarctica*], **World record low temperature, −117.4°F [−83.0°C.] at Sovetskaya 78°24′S., 87°35′E.,** *Monthly Weather Review*, Wash., D. C., 86(6):236, June **1958. DWB, DLC.** Also his: **World record minimum.** *Weatherwise*, Boston, 11(4):139, Aug. **1958. DWB**—A report of a new low temperature record for the world was received from Mr. Rubin. Three successive records were set: at Vostok (78°27′S., 106°52′E., elevation approximately 3500 meters) on June 15, −113.3°F (−80.7°C) was recorded; at Sovetskaya (78°24′S., 87°35′E., elevation approximately 3700 meters) on June 19 the temperature fell to −113.8°F (−81.0°C.), and on June 25 to −117.4°F (−83.0°C). The new record at Sovetskaya is "taken from corrected weekly thermograph trace with 3-hourly comparisons during periods of extreme temperatures." The following further information regarding the conditions under which these temperatures occurred is taken from Rubin's dispatches. *Subject Headings:* **1. Record low temperatures 2. Sovetskaya, Antarctica.**—*Author's abstract.*

12.4–253 551.524.36(99)

Rubin, Morton J., **World record low temperature.** *Monthly Weather Review*, Wash., D. C., 86(8):308, Aug. **1958. DWB, DLC**—Antarctica has again broken the world low temperature record. A message received from Morton J. Rubin at Mirny, Antarctica announced the following minimum temperature readings: At Vostok (78°27′S, 106°52′E) −85.8°C (−122.4°F) was measured between 1200 GMT Aug. 7 and 0000 GMT Aug. 8, 1958; at Sovetskaya (78°24′S, 87°35′E) −86.7°C (−124.1°F) between 1900 and 2000 GMT, on Aug. 9, 1958. The Sovetskaya minimum was measured with a remote electrical resistance thermometer with a known correction, exposed in the shelter. "The temperature was lower immediately afterward but no calibration for thermometer," the message stated. *Subject Headings:* **1. Record low temperatures 2. Sovetskaya, Antarctica.**—*Author's abstract.*

12.4–254 551.524.36(73)

*Seamon, L. H. and Bartlett, G. S., (*both, Off. of Climat., U. S. W. B., Wash., D. C.*), **Climatological extremes, Pt. 3.** *Weatherwise*, Boston, 10(6):202–205, Dec. **1957.** 2 figs., rest all tables. (For Pt. 1, *see* 9.4–237, April 1958, *Met Abs.*) **DWB**—Highest temperature recorded in each month of the year in the United States in addition to the year, day, place, (state and station), and the highest temperature, date and station for each state for entire period of record, are shown in a table and the data plotted on a map or chart of the U. S. Maine, New Hampshire, and Connecticut have had extreme highs of only 105°, Rhode Island 102°, and Alaska and Hawaii only 100°, but California has had 134°, Arizona 127°, and even Washington and Montana have had 118° and 117° at some time in the last 60 or 70 years. Similar tables and map are given for record lowest temperatures (−70° in Montana, 1954 and −76° in Tanana, Alaska in 1886). Florida has had a low of −2°F. Unofficial temperatures are bound to be lower. *Subject Headings:* **1. Temperature extremes 2. Record low temperatures 3. Record high temperatures 4. United States.**—*M.R.*

12.4–255 551.524.36(71)

Thomas, Andrew (*Director, Met. Br., Air Services, Toronto*), **Lowest temperature in Canada.** *Monthly Weather Review*, Wash., D. C., 86(8):298, Aug. **1958. DWB, DLC**—Reference to article by Nina Stepanova Zikeev in Jan. 1958 *MWR* (*see* 10.4–36, April 1959, *Met. Abs.*). The author states that since Feb. 1957 there have been no official temperatures in Canada lower than −80°F. The absolute lowest at Snag on Feb. 2, 1947 was −80.1°F and on Feb. 3, −81.4°F, although on the monthly weather map −83° was reported. *Subject Headings:* **1. Record low temperatures 2. Snag, Yukon.**—*M.R.*

12.4–256 551.524.371:634.3

Georg, J. G. (*Meteorologist*), **The use of wind machines for frost protection of Florida citrus 1958–59.** *Federal-State Warning Service, Lakeland, Fla., Weather Forecasting Mimeo* 59-10, April 21, **1959.** 7 p. 21 figs. **DWB**—A report on a cooperative effort by the Federal State Frost Warning Service and Lake Garfield Nurseries Company, Barlow, to ascertain if the wind machine provided adequate frost and freeze protection under Florida weather conditions.

It covers investigations at two locations during the 1958 season and only includes the nights that posed a threat to citrus. The details of the experiments and of the instrumentation used to value the effectiveness of temperatures contributed by machines are given. Temperature differences contributed by the machines are graphically represented. A brief description of meteorological conditions and other pertinent notes accompany the graphs. The specific conclusions arrived at through the study are listed. *Subject Headings:* **1. Frost protection of orchards 2. Frost protection methods 3. Frost warning service 4. Wind machines 5. Florida.**—*I.S.*

12.4–257 551.582.3:551.524.37(771):632.111.5

*Pierce, L. T. (*Columbus, Ohio, Agri. Exper. Station*), **The occurrence of freezing temperatures in late spring and early fall.** *Ohio. Agricultural Experiment Station, Wooster, Special Circular*, No. 94, Oct. **1959.** 15 p. 34 figs., 5 tables, 8 refs. **DWB** (M(055) 037sp) The occurrence of freezing temperature in the late spring and early fall is damaging to plants. The extent of injury sustained is determined, not only by the lowest temperature reached, but also by the duration of freezing temperature, the rate of temperature change, etc. Against this background the present report discusses the data for the State of Ohio concerning the probability occurrences of significant threshold temperatures. The 55 stations from which the data were collected are tabulated and their geographical locations are shown on a map. 36°, 32°, 28°, and 24° are considered of greatest importance. Percentage chance of 32° freeze occurring on or after given dates in spring and on or before given dates in fall are tabulated. These same data have been plotted on maps to show their distribution over the state, and to permit a selection of dates to be made for other locations. Similar maps are presented to show the percentage chance of occurrence for 36°, 28°, and 24°, representing freezes of less or greater severity. *Subject Headings:* **1. Freezing temperature data 2. Freezing temperature probabilities 3. Ohio.**—*I.S.*

SOIL TEMPERATURE (551.525)

12.4–258 551.525.2:551.578.46:536.24(713)

Gold, L. W., **Influence of snow cover on heat flow from the ground: some observations made in the Ottawa area.** *International Union of Geodesy and Geophysics. Assoc. of Scientific Hydrology, Toronto, Sept. 1957*, [*Transactions*], Vol. 4, pub. **1958.** p. 13–21. 4 figs., 3 tables, 7 refs. **DWB, DLC**—A continuous record was kept at Ottawa, Ontario, of the heat flow from the ground into the snow-cover and temperatures in the ground, snow and air during the two winters 1955–56 and 1956–57. A correlation was found between the difference in the mean air temperature and the temperature 5 centimeters under the ground, the snow depth and the heat flux. Values were obtained for the effective thermal resistance of the snow cover under field conditions. *Subject Headings:* **1. Snow cover effects on soil temperature 2. Thermal conductivity of snow 3. Soil temperature under snow 4. Snow-air temperature relationships 5. Ottawa, Canada.**—*Author's abstract.*

12.4–259 551.525.2(713)

Pearce, D. C. and Gold, L. W. (*both, Div. Build. Res. Nat'l. Res. Coun., Ottawa, Canada*), **Observations of ground temperature and heat flow at Ottawa, Canada.** *Journal of Geophysical Research*, Wash., D. C., 64(9):1293–1298, Sept. **1959.** 4 figs., 2 tables, 5 refs., 2 eqs. **DLC** — Observations were made at a site in Ottawa, Canada, on the thermal regime of the ground and the heat flow 10 cm below the ground surface. Close agreement was found between the thermal diffusivities calculated from the depth dependence of the temperature amplitude and the depth dependence of the phase angle. It was also found that the annual component of the rate of heat flow was out of phase with the annual component of the ground temperature by 45.8 degrees. These observations showed that for the Ottawa site the annual wave of ground temperature and the annual component of the rate of heat flow are consistent with the simple theory of periodic heat flow in a one-dimensional, semi-infinite, homogeneous medium. In accordance with this theory, thermal constants for the soil at the test site were calculated from the observations. *Subject Headings:* **1. Soil heat flux 2. Soil temperature data 3. Ottawa, Canada.**—*Authors' abstract.*

12.4–260 551.525.4/5

*Lobdell, Herbert L. (*Soils Eng., Greer Eng. Assoc.*); Turner, Kenneth A., Jr. (*Ass't. Res Spec. Instrumentation*) and Jumikis, Alfreds R. (*Rutgers Univ.*), **Study of subsurface temperature in six soils during the winter of 1953–1954.** *National Research Council, Wash., D. C. Highway Research Board, Bulletin*, No. 168:123–142, **1957.** 19 figs., 7 tables, 2 refs. **DWB**—During the winter of 1953–54 subsurface temperature measurements were performed on six New Jersey soils. The studies revealed that: 1) Granular, non-plastic soils are better conductors of heat (and cold) than fine-grained soils and react to air temperature changes more quickly. Of the six studied, a clean sand (MRB A-3), was the best conductor and an MRB A-7-6 soil was the poorest conductor. Therefore, frost enters and goes out of granular soils more rapidly than in the case of fine-grained soils, causing more frequent freeze and complete thaw cycles. 2) A concrete slab is a better conductor of heat than soil of the same thickness. Therefore, freezing and complete thaw cycles occur more often below a concrete slab or pavement than in the adjacent shoulder. 3) A combination of a concrete slab over a granular soil is one that reacts most quickly to cold and warm spells. Shoulder of fine-grained soil shows little reaction to cold and warm spells (except at the surface) and reflects the over-all intensity of cold of the winter. 4) The freezing line generally penetrates to a greater depth in granular soils than in fine-grained soils. 5) There is a lag between the minimum air temperature of winter and the maximum penetration of the 32 degree line. In the cases studied the lag was one day, except for some of the shoulders of fine-grained soils, where the lag was several days. 6) Maximum heaving does not necessarily occur at the time of the maximum depth of the 32 degree line. 7) Most thawing in soil occurs from the top downward during thaw periods; however, some thawing takes place from the bottom. 8) Temperature studies indicate the necessity of measuring and knowing the surface temperature of the slab or ground surface. *Subject Headings:* **1. Subsurface temperature measurements 2. Soil temperatures—soil type relationships 3. Soil freezing 4. Soil thawing 5. New Jersey.**—*Authors' abstract.*

12.4–261 551.525.5:631.4

†Lovell, C. W., Jr. (*Res. Eng. Purdue Univ., Lafette, Indiana*), **Temperature effects on phase composition and strength of partially-frozen soil.** *National Research Council*, Wash., D. C. *Highway Research Board, Bulletin*, No. 168:74–95, **1957.** 12 figs., 6 tables, 30 refs. **DWB**—The primary objective of this study was the determination of the relative amounts of frozen and unfrozen moisture in several fine grained soils over a range of below freezing temperatures. A secondary goal was the definition of the importance of subzero temperature (and phase composition) on the strengths of the same test soils. Three soils were utilized—a silt of glacial origin, a silty clay of the Wisconsin drift, and a clay derived in place from limestone. The soils were characterized in the usual manner, and in addition their specific heats and behaviors in a desorption process were defined. The calorimetric method was used to determine the amount of ice in a molded specimen of known total moisture, density, and subzero temperature. The phase composition of the test soils was found to vary significantly between soils at a given temperature level, and to change significantly for a single soil with lowering of temperature. For example, comparing soils molded to standard Proctor peak conditions, the following approximate percentages of original moisture frozen obtained: at −3°C silt 73%, silty clay 42%, clay 16%; at −25°C, silt 83%, silty clay 62%, clay 50%. Attempts to correlate the results of experimental desorption tests with the calorimetric data met with very limited quantitative success. Unconfined compression tests were undertaken at controlled subzero temperatures with stress rates of loading of 160 or 200 psi per minute. Maximum compressive stress demonstrated a high temperature dependency for all test soils. For example, again comparing samples molded to standard Proctor peaks, the approximate ratio of compressive strength at −18°C to that at −5°C was more than 4 to 1 for the silty clay and almost 3 to 1 for the clay. It was concluded that substantial proportions of the total moisture (defined by drying to constant weight at 105°C) of fine-grained soils may remain unfrozen at temperatures as cold as −25°C and that the changes in strength accompanying change in temperature within this range emphasize the practical significance of relative phase composition. *Subject Headings:* **1. Frozen soil 2. Frozen soil measurements 3. Frozen soil strength.**—*Author's abstract.*

WATER TEMPERATURE (551.526)

See: **Ocean temps.** (Robinson, Stommel), 12.4–179; **Pleistocene ocean temps., N. Atlantic, Arctic** (Ewing, Donn), 12.4–310.

PRESSURE AND WIND

PRESSURE (551.54)

See: **Pressure field effects on gradient wind** (Rudloff), 12.4–188; **850 mb calculations, Yugoslavia** (Jurčec), 12.4–190; **Ageostrophic wind magnitude** (Angell), 12.4–194; **500 mb prognostic chart preparation** (Khazova, Chapygina), 12.4–209; **Pressure field-wind relationships** (Faust), 12.4–237; **Effect of irregularities of relief on sea level pressure** (Musselian), 12.4–323.

WIND AND TURBULENCE (551.551)

See also: **Turbulence effects on aircraft** (Zbrozek), 12.4–48; **Analysis of acceleration, airspeed and gust velocity data** (Engel, Copp), 12.4–49; **Turbulence effects on electron density** (Howells), 12.4–131; **Ageostrophic wind magnitude** (Angell), 12.4–194; **Vector winds, U. S.** (Ratner), 12.4–321.

12.4–262 551.551:621.396.11

Thompson, Moody C., Jr.; James, Harris B. and Freethey, Frank E., **Atmospheric limitations on electronic distance measuring equipment.** *U. S. National Bureau of Standards, NBS Report*, No. 6060, May 29, **1959.** 7 p. 8 figs., 2 refs., eqs. **DWB** (M51 U584at)—The National Bureau of Standards has studied the effects and characteristics of atmospheric turbulence in relation to the speed at which radio or light signals travel through the atmosphere and the time required for it to progress from one point to another. The measurement of speed is a problem fundamental to electromagnetic wave propagation and there are a few factors that limit precision in this field. Air density and composition at every point in the lower atmosphere of the earth vary and they are discussed here. The report is based on the index measurements obtained from five meteorological stations with varying elevations. *Subject Headings:* **1. Atmospheric turbulence 2. Electronic distance measuring equipment.**—*N.N.*

12.4–263 551.551.2:551.524.4:551.510.522

Edinger, James G. and Kao, Shih-Kung, **The influence of terrain and thermal stratification on flow in the surface and planetary boundary layers.** California. University, Los Angeles. Dept. of Meteorology, Contract AF 19(604)-2424, Final Report, Sept. 30, **1959.** Each section separately paged. figs., numerous refs. eqs. Contents: Edinger, James G., **Wind structure in the lowest 5 km above Santa Monica, California.** 12 p. Kao, Shih-Kung, **Stationary flow in the planetary boundary layer with an inversion layer and a sea breeze.** 7 p. Kao, Shih-Kung, **Turbulent transfer in the boundary layer of a stratified fluid** (reprinted from *Journal of Meteorology*, 16(5):497–503, Oct. **1959,** and abstracted separately). 13 p. **DWB**—Sec. I describes and analyzes the summertime wind structure in the lowest 5 km of the atmosphere above Santa Monica, Calif., and attempts to determine the influence of complex orography and a persistent inversion on the flow across the coastline. Sec. II—In recent years synoptic analysis of the lower troposphere over the coastal plain of California shows that during the summer seasons a temperature inversion occurs in the layer between 500 and 1000 m on the average (Neiburger, Beer and Leopold, 1944). Under this inversion layer a land-sea breeze prevails. On account of the presence of this inversion layer, the flow in the planetary boundary layer deviates greatly from that in a homogeneous fluid. A detailed description and discussion of the diurnal wind distribution at various levels over Los Angeles Basin has been given by Edinger (1959). It is the objective of this note to examine the effect of a temperature inversion and a sea-breeze on the stationary flow in the planetary boundary layer as a first step to the understanding of the mechanism of this system. *Subject Headings:* **1. Temperature inversions 2. Sea breeze effects 3. Planetary boundary layer 4. California coastal plain.**—*Authors' abstract.*

WIND DISTRIBUTION AND VARIATION (551.552/3)

See also: **"Evgei" winds, Ala-Kul, Kazakhstan** (Porfir'ev), 12.4–207; **Maps of wind fields over ocean** (Sorkina), 12.4–303.

12.4–264 551.553:551.510.522:551.43

*Yoshino, M. (*Dep. of Geography, Tokyo Kyoiku Univ.*), **Wind speed profiles of the lowes air layer under influences of micro-topography.** *Meteorological Society of Japan, Tokyo Journal*, Ser. 2, 36(5):174–186, Oct. **1958.** 11 figs., 9 tables, 15 refs., 2 eqs. **DWB, DLC**—In order to explain the influences of micro-topography on the wind structure near the ground the variation of wind speed with height up to 5 m above the ground was observed at various stations situated on the flat open land and on the side slopes or in the bottom of the smal valley. Differences of the profiles from the so-called logarithmic law were evident. The types of the profiles were grouped roughly into three types according to their micro-topographic situation. When the prevailing wind flows at right angle to the running direction of the small valley having steep side slopes, maximum of wind speed at 2–3 meters above the ground appeared on the lower part of the valley slope or in the valley bottom, owing to the counter flow of the lower part of eddies formed in the valley. The counter flow had some twisted characters with the direction of mountain or valley wind and the ratio of its speed to that of the prevailing wind showed a relation to the prevailing wind speed and the time of day. *Subject Headings:* **1. Wind speed near the ground 2. Orographic effects on winds 3. Micrometeorological wind profiles.**—*Author's abstract.*

12.4–265 551.553.8:551.515.8(67)

Tschirhart, G., **Les conditions aérologiques à l'avant des lignes de grains en Afrique Equatoriale.** [Aerological conditions in front of squall lines in Equatorial Africa.] *France, Météorologie Nationale, Monographies*, No. 11, Dec. **1958.** 28 p. 12 figs., 1 ref. **DWB**—This study is principally based on the aerological soundings made for 2 years at a station in Léopoldville (Belgian Congo). It examines the possibility of drawing up a method for detecting, locating and even reckoning the intensity and evolutionary direction of squall lines in Equatorial Africa. Analyses of soundings have proved that all those made in front of a squall line present a peculiar and exclusive structure. The author considers vertical distribution of the divergence within a squall line; horizontal distribution of the divergence on both sides of a squall line; distribution of upper winds; thermal distribution; surface pressure and temperature. This study points out that ahead of a squall line winds are weakened within the middle layers (600–400 mb) and strengthened within the superior layers (300–150 mb). On the contrary, to the rear of a squall line winds grow stronger within the middle layers and weaker within the superior layers. Ahead of a squall line within the superior layers winds take a northerly component (Southern Hemisphere) and a southerly component within the middle layers. Within the middle layers exists a divergence zone topped by a convergence zone. One observes downward motions increasing with altitude, but decreasing rapidly in the convergent zone up to complete annulment or even inversion (upward motion) if convergence is sufficient. Ahead of the squall line appears an important fall of pressure owing to the excess of divergence and a high relative temperature. These results are illustrated with the analysis of several soundings made at Léopoldville, and similar characters are found with the same sharpness in other stations of Equatorial Africa. *Subject Headings:* **1. Squall lines 2. Aerologic conditions 3. Equatorial Africa 4. Léopoldville, Belgian Congo.**—*A. V.*

VERTICAL DISTRIBUTION (551.554)

See also: **Wind shear, U. S.** (Ratner), 12.4–321.

12.4–266 551.554:551.515.2

Jordan, Charles L. (*Dept. Met., Fla. State Univ.*), **Vertical profiles of wind velocity in tropical cyclones.** (In: Technical Conference on Hurricanes, Miami Beach, Fla., Nov. 19–22, 1958, **Proceedings,** issued **1958**(?). Section E2 (6 p.) 5 refs.) **DWB (M15.2 A512pr)**—The discussion is based on rawin observations in the lower 20,000 ft at Kadena AFB in Okinawa. Increase of wind speed in the lower 2000 ft can be more than 50 knots in the first 1000 ft.

The wind profiles show complex vertical variations; in some cases with little smoothing, the curvature would remain almost the same up to 20,000 ft; in other cases the changes were substantial. *Subject Headings:* **1. Tropical cyclones 2. Hurricane conferences.**—*W.V.*

SPECIAL WINDS AND WIND EFFECTS (551.556)

See also: **Wind loads on buildings,** 12.4–94; **Tornado damage patterns, Wisconsin** (Hall, Brewer), 12.4–240; **Shelter belt effects on wind erosion, Transvolga** (Gruzdev), 12.4 326; **Dynamic climat. of cold outbreaks, Far East** (Suda), 12.4–330.

12.4–267 551.556.8:551.465

Ozmidov, R. V., **Obobshchenie teorii nestatsionarnykh chisto dreĭfovykh techeniĭ Ekmana na sluchaĭ proizvol'nogo vetra.** [Extension of Eckman's theory of unsteady purely drift currents to the case of arbitrary wind.] *Akademiia Nauk SSSR, Doklady,* 128(5):913–916, **1959.** fig., ref., 19 eqs. **DLC**—The problem of drift current produced by a wind which is variable both in direction and velocity is examined. The equation of motion of a fluid in a purely drift current is solved without taking into account lateral friction and it is shown that for the general case the depth of friction depends not only upon the coefficient v and on the angular rotation of the earth but also upon the angular frequency of the wind stress giving rise to the current. Hence the depth of friction is non-uniform for winds with different periods. The solution of the equation of motion in a drift current, taking into account lateral friction is presented. It is concluded that marine drift currents of this type are superpositions of different wave velocities whose amplitudes, also the velocity of subsidence with depth and other characteristics, depend essentially upon the coefficients of turbulent friction and frequency of the corresponding harmonic components of the wind friction stress producing the flow. *Subject Headings:* **1. Wind driven currents 2. Eckman's theory.**—*I.L.D.*

UPPER AIR WINDS (551.557)

See: **Jet streams** (Pogosian), 12.4–5; **Practical applications in flying jet streams** (Cronin), 12.4–50; **Ionos. drift** (Checha, Zelenkov), 12.4–132; **Ionos. drift** (Erofreev), 12.4–133; **Gradient wind computation** (Rudloff), 12.4–188; **Transfer of angular momentum as a factor in zonal wind deviation** (Rakipova), 12.4 229; **Stratospheric monsoons** (Barbé), 12.4–235; **Pressure field-wind relationships** (Faust), 12.4–237; **Entomological problems in humid tropics** (Kapur), 12.4 317; **Stratified climat. of upper winds** (Christensen et al.), 12.4–320.

AQUEOUS VAPOR AND HYDROMETEORS

HUMIDITY (551.571)

See: **Moisture content measurement** (Steru), 12.4–96; **Vapor trap for measuring stratosphere humidity** (Barclay et al.), 12.4–201; **Horizontal transport of water vapor** (Ferreira, Peixoto), 12.4–222; **Dew formation and vapor pressure** (Long et al.), 12.4–272; **Electronic collision cross sections of water vapor** (Lassettre, White), 12.4–350.

EVAPORATION AND EVAPOTRANSPIRATION (551.573)

See: **Review of literature on evaporation suppression** (Magin, Randall), 12.4–44.

CONDENSATION (551.574)

See also: **Airplane cloud physics measurements** (Zaĭtsev, Ledokhovich), 12.4–7; **Cloud physics** (Twomey), 12.4–189.

12.4–268 531.32:551.574.1

Pshenaĭ-Severin, S. V., **O gidrodinamicheskom vzaimodeĭstvii oblachnykh kapel' na malykh rasstoianiiakh.** [Hydrodynamic interaction of cloud drops at short distances.] *Akademiia Nauk SSSR, Izvestiia, Ser. Geofiz.,* No. 10:1254–1257, Oct. **1958.** fig., 2 tables,

4 refs., 4 eqs. **DLC.** Transl. into English in the corresponding number of its *Bulletin of the Academy of Sciences, USSR, Geophysics Series.* **DLC**—In the investigation of the process of orthokinetic coagulation of cloud droplets it is necessary to have formulas for determining the forces of resistance when two interacting droplets of different radius move with different velocities. For a quasistationary approximation, the case of movement of two droplets with different velocities in a Stokes regime of flow, the following equations are obtained: $f^{(1)}=6\pi nR_1(a_{11}V^{(1)}+a_{12}V^{(2)})$; $f^{(2)}=6\pi nR_2(a_{21}V^{(1)}+a_{22}V^{(2)})$. With these formulas it is possible to compute up to the collision of the drops and the results of computation are presented in a table in which the multipliers λ_1, and λ_2 characterize the diminution of resistance forces resulting from the interaction of drops in the case of $V^{(1)}=V^{(2)}=V$. These multipliers are determined from the relationships $f^{(1)}=\lambda_1 f_{st}{}^{(1)}$, $f^{(2)}=\lambda_2 f_{st}{}^{(2)}$, $f_{st}{}^{(i)}=-6\pi nR_iV$. A comparison of λ for different values of $\epsilon(\epsilon_i=R_i/r_{12})$ computed by means of the above formula and an approximate formula is presented. The rates of fall of water drops in air computed according to a quasistationary pattern are given in a table. The data demonstrate that as a result of hydrodynamic interactions the velocity of fall of each drop increases, but the velocity of approach of falling drops in a Stokes regime of flow diminishes. *Subject Headings:* **1. Orthokinetic coagulation of cloud droplets 2. Drop velocities.**—*I.L.D.*

12.4–269 551.574.11:551.578.1

Junge, C., **Das Auswaschen der Atmosphäre durch Niederschlag und die grossräumige Verteilung der Kondensationskerne.** [The cleansing of the atmosphere through rainfall and the large area distribution of condensation nuclei.] *Frankfurt a.M. Universität. Meteorologisch-Geophysikalisches Institut, Bericht,* No. 6:31–33, **1956.** 2 refs.—The source of the majority of condensation nuclei over the oceans and the extent to which rainfall removes condensation nuclei from the atmosphere are considered. The time which it takes the aerosol content of the troposphere to be halved is examined on the assumption that this half value time depends upon the mean precipitation amount of an area and upon the size of the particles. It is found that sea salt nuclei, the radius of which is greater than 1μ are washed out by rain. On the other hand Aitken nuclei with radius less than 1μ originate in western Europe, in North America and in part also in Asia. *Subject Headings:* **1. Aerosol content of atmosphere 2. Condensation nuclei density 3. Washing of nuclei by precipitation.**—*I.L.D.*

12.4–270 551.574.11:536.422

Miura, Akira (*Tohoku Univ.*), **Role of solid nuclei in sublimation.** *Tohoku Univ., Science Reports, 5th Ser., Geophysics,* 11(3):162–177, Dec. **1959.** 5 figs., 2 tables, 14 refs., 58 eqs. **DWB, DLC**—The author studied thermodynamically the role in sublimation processes of the maximum water vapor pressure on the thin film which is formed on the insoluble solid particle with use of Gibbs free energy. It is found that the wettable solid particle can act as a sublimation nucleus. *Subject Headings:* **1. Solid nuclei sublimation 2. Sublimation nuclei.**—*Author's abstract.*

12.4–271 536.7:551.574.41

Hofmann, Gustav (*Metr. Inst., Univ. of Munich*), **Dew measurement by thermodynamical means.** *International Union of Geodesy and Geophysics. Association of Scientific Hydrology, Toronto, Sept. 1957,* (*Transactions*), Vol. 2, pub. **1958.** p. 443–445. 4 refs., 14 eqs. **DWB** (M(06) I611g)—Since the heat released in the condensation of dew influences the temperature of a body, it is possible to measure dew rate on an artificial dew collector by measuring its temperature. The design of an apparatus working on this principle is described. Dew measurements made on a night with varying cloud cover show the influence of nocturnal net radiation on the dew fall. By means of a thermodynamic dew formula the effects of different meteorological factors on dew formation are outlined. *Subject Headings:* **1. Dew measurement techniques 2. Thermodynamics of dew formation.**—*N.N.*

12.4–272 551.574.41:551.584.42:551.571.4

Long, I. F. et al., **[Discussion of] J. L. Monteith: Dew [and] Reply by Monteith.** *Royal Meteorological Society, Quarterly Journal,* 84(360):188–190, April **1958. DWB, DLC**—I. F. Long, J. Lorch, R. G. Veryard, E. Gold and others comment on the peculiarities of dew

formation on grass, vegetables, instrument shelters, etc. under varying cloud, wind and vapor pressure gradient. MONTEITH replies that vapor pressure gradients always develop on nights when dew forms but the time element may have been overlooked by others—i.e. a gradient may be reversed when dew starts to form. The exact time when dew begins to form cannot be determined by a balance such as is used at Harlington or by a Hirst's dew balance, (*see* 5.8–57, Aug. 1954, *Met. Abs.*) Guttation does occur. Dew forms more easily on insulated surfaces such as tops of shelters, cars, etc. (For original article, *see* 8.10-219, Oct. 1957, *Met. Abs.*) *Subject Headings:* **1. Dew formation 2. Vapor pressure gradient over vegetation.** —*M.R.*

12.4–273 551.582.3:551.574.42(479)

†Chirakadze, G. I., **Skhema gololednogo raĭonirovaniia Zakavkaz'ia.** [A glazed frost regional map of the Transcaucasus.] *Meteorologiia i Gidrologiia*, Leningrad, No. 1:34–37, Jan. **1959.** fig., table, **DWB, DLC.** Longer version in *Tiflis. Nauchno-Issoedovatel'skiĭ Gidrometeorologicheskiĭ Institut Trudy*, Leningrad, No. 4:124-152, **1959.** 5 figs., table, 31 refs. **DWB**—The meteorological and topographic factors favoring icing in the Transcaucasus are summarized and it is found that with respect to hydrometeors participating in icing this region may be divided into two zones: a western zone extending from the Black Sea to the Kartalino-Imeretinskiĭ range, and an eastern zone extending from the latter to the western shore of the Caspian Sea. In the former wet snow predominates in icing; in the latter glaze and hoar frost predominate. The Transcaucasus was divided into 6 glazed frost regions on the basis of the height of the deposit and its specific weight. The method for computing the incidence of wet snow, the size of the glazed frost deposit and the specific weight is described and a map showing the glazed frost regions, and a table giving various data for computing the deposits by regions, are presented. *Subject Headings:* **1. Icing 2. Glazed frost 3. Transcaucasus, U.S.S.R.**—*I.L.D.*

CLOUDS (551.576)

See also: **Height of Cu and Cb clouds in Poland** (Demianczuk), 12.4–51; **Cloudy weather and air pollutants as causes of unusually dark forenoon, Budapest** (Péczely), 12.4–217; **Importance of thermodynamics in cloud formation** (Dinkelacker), 12.4–228; **Lightning and atmos. radiation** (Ishikawa, Kimpara), 12.4–353.

12.4–274 551.509.318:551.576.1

Conover, John H. and Sadler, James C. (*both, GRD, A. F. Camb. Res. Center, Mass.*), **Cloud patterns as seen from altitudes of 250 to 850 miles: Preliminary results.** *American Meteorological Society, Bulletin*, 41(6):291–297, June **1960.** 5 figs. **DWB, DLC.** Also issued as *U.S. Air Force. Cambridge Research Center, GRD Research Notes*, No. 36:31–45, June **1960.** 5 figs. **DWB**—Time-lapse films of the earth from high flying ballistic missiles have provided the meteorologist with the first synoptic detailed coverage of cloud patterns over large areas. Analysis of the film obtained on 24 Aug. 1959 shows the cloud patterns over an area corresponding to one-twentieth of the earth's total surface. Comparisons of the rectified cloud positions with the high- and low-level synoptic charts show large-scale cloud patterns directly associated with high-level vortices and troughs as well as patterns associated with a quasi-stationary front and the intertropical convergence zone. Details suggesting low-level vortices, frontal waves, and a squall line appear, but they cannot be verified due to sparse surface observations. Other details, such as the effects of large and small islands, coastlines and rivers upon the pattern of vertical motion are indicated by the clouds. *Subject Headings:* **1. Synoptic analysis of cloud patterns 2. Tiros cloud photographs 3. Cloud photographs from satellites 4. Tiros I.**—*Authors' abstract.*

12.4–275 551.509.58:551.576.1(794)

Farnham, D. L. (*U. S. Naval Ord. Test Station*), **Objective forecasting of cirrus cloudiness at the Naval Ordnance Test Station.** *U. S. Naval Ordnance Test Station, Inyokern, Calif., NAVORD Report*, No. 6550, NOTS TP 2249, May **1959.** 15 p. 3 figs., 4 tables, 6 refs. **DWB**—The development of a rapid and relatively simple objective method of forecasting cirrus cloudiness at the Naval Ordnance Test Station, China Lake, Calif., is presented. Results

of its use from March through May 1959 are shown. Conclusions that the method has forecasting advantages are reached. *Subject Headings:* **1. Cirrus forecasting 2. Objective forecasting methods 3. China Lake, Calif.**—*Author's abstract.*

12.4–276 551.576.1:551.511.13(94)

Sparrow, G. W. A., **Pilaeus cloud in association with small cumulus.** *Australian Journal of Science*, Sydney, 21(6):193, Jan./Feb., **1959. DLC**—An explanation is given of extraordinary occurrences of pilaeus clouds in the vicinity of Swan Hill in the Murray Valley during a wet spell near the end of Sept., 1959. It is theorized that the occurrence of a strong grass growth induced a local increase in the instability of the air mass, sufficient to initiate the formation of pilaeus, while the highly cultivated and irrigated areas (relatively free of vegetation at this season) had a high albedo in contrast to the low albedo of the grass covered and nonirrigated regions. *Subject Headings:* **1. Pilaeus clouds 2. Instability 3. Swan Hill, Australia.**—*O.T.*

12.4–277 551.576.11(439.1)

Dobosi, Zoltán, **A borultság szerkezete Budapest fölött.** [Structure of cloudiness over Budapest.] *Időjárás*, Budapest, 63(5):293–298, Sept./Oct. **1959.** 2 figs., 2 tables, 6 refs. Hungarian and English summaries p. 293. **DLC**—The author analyzes the structure of the cloudiness according to the main types of clouds and discusses also the yearly march of the amount and frequency of the main cloud-types in the principal standard times. On the basis of daily six observations carried out in January, April, July and October the daily march of the cloudiness is analyzed. *Subject Headings:* **1. Cloud systems 2. Cloudiness classification 3. Budapest, Hungary.**—*Author's abstract.*

12.4–278 551.506:551.576.2(437.1/.2)

Calábek, Vladimír, **Oblačnost v lázních Luhačovicich v letech 1921–1950.** [Cloudiness at the spa of Luhačovice, 1921–1950.] *Meteorologické Zprávy*, Prague, 12(5):114–118, **1959.** 8 figs., 2 tables, 6 refs. Czech, Russian and English summary p. 114. **DWB, DLC**—In this article statistical characteristics of the monthly and yearly average cloudiness and the frequency of clear and cloudy days at the Moravian spa of Luhačovice for the years 1921–1950 are given. The validity of Kremser's relation was also verified between the cloudiness and the frequency of clear and cloudy days. *Subject Headings:* **1. Cloudiness data 2. Luhačovice, Czechoslovakia.**—*Author's abstract.*

PRECIPITATION (551.577)

See also: **Precip. effects on radioactivity** (Dorporto), 12.4–85; **Precip. effects on radar** (Saxton), 12.4–192; **Importance of thermodynamics in precip. formation** (Dinkelacker), 12.4–228; **Excessive rainfall during cyclones, Madagascar,** 12.4–238, 12.4–239; **Normal precip. data, Israel,** 12.4–299; **Precip.-winter temp. relationships** (Zimmerschied), 12.4–301; **Precip. variations, U. S.** (Landsberg), 12.4–308; **Annual cycle of birthrates** (Otto, Reissig), 12.4–318; **Fluctuation in continentality** (Diaz), **12.4–322; "Dead" horizon and water regime of soils, Veliko-Anadol Massif** (Iroshnikov), 12.4–327; **Environmental factors affecting population growth** (Horáček), 12.4–333.

12.4–279 551.553.21:551.577.32(54)

Sinha, K. L., **Incidence of widespread rain in different seasons in the various parts of India and Pakistan.** *Indian Journal of Agricultural Science*, New Delhi, 28(3):359–371, Sept. **1958.** 6 figs., table. **DWB**—Features and connected meteorological factors of rainfall in Indo-Pakistan area are studied. The procedure followed by the Indian Meteorological Department lays more stress on the extent in space of the rainfall which gives no idea regarding the amount of rainfall. For meteorological purposes, the year is divided into four periods: winter (Dec.–March), pre-monsoon (April–May), monsoon (June–Sept.) and post-monsoon (Oct.–Dec.). The average rainfall on a rainy day during these periods and the year as a whole for certain stations is given. The southern part of the Peninsula has the highest incidence of rainfall because of the (1) process of retrea tof the southwest monsoon, (2) setting in of the northeast monsoon, (3) east to west movement of low pressure waves through the south Bay of Bengal and (4) invasion of cyclonic storms. In the end the number of days of widespread

rainfall for various meteorological sub-stations in different seasons are tabulated. *Subject Headings:* **1. Rainfall distribution 2. Monsoon effects on rainfall 3. India 4. Pakistan.** —*I.S.*

12.4–280 551.509.3:551.501.81:551.577.37(52)

Imai, I.; Yanagisawa, Z. and Liao, S., **Radar and meso-synoptic analyses of heavy rainfall in the Kantō District on Aug. 5–8, 1957.** *Journal of Meteorological Research*, Tokyo, 12(1):9–37, Jan. **1960.** 66 figs., 10 refs. In Japanese; English summary p. 9. **DWB**—Radar and meso-synoptic analyses are made for the heavy local rainfall that occurred on 5–8 Aug. 1957 in the Kanto District. Rain was abundant especially in some restricted areas of the northern Kanto and Shizuoka Prefecture. Detailed analyses are made for the case of Aug. 7 storms. The heaviest storm of that day commenced near Utsunomiya at about 1640 JST and developed and lasted for more than four hours. The rainfall at Utsunomiya amounted to 219 mm. The storm was of thunderstorm nature, but new cells were generated in a limited area for a comparatively long time, which formed the probable cause of the local heavy rainfall. The echo of such stationary heavy rainfall is generally oval- or spindle-shaped. At its southwestern (upwind) end, the echo height is low and the boundary is clear-cut due to the continual generation of new cells, whereas in the northeastern (downwind) portion, the echo height is as high as 8–12 km and the boundary is very diffuse because of the vertical development of cells. The locations of new cell generation formed a line before 1930 JST, but thereafter they moved somewhat southward and became rather clustered. Hourly meso-maps for the Kanto area show that a mesosystem developed from each heavy rainfall area and spread southward. The apparent southward movement of the cold front as seen on the large-scale map must be the result of the spread of such mesosystems. It is difficult to draw a single front on a meso-map. Some relations are recognized between the cell generation and the movement of the mesosystems. The thickness of the cold air composing a mesosystem is considered to be less than 1000 m, so that its movement is largely affected by topography. From traces of recording instruments, a certain microstructure of a mesosystem is deduced. Some echo analyses are made about the stationary rainbands that appeared on Aug. 5 in the eastern Kanto plains. It is found that they are formed by successive generation of cell echoes over the Boso Peninsula and their subsequent movement toward the north due to the southerly winds in the lower troposphere. Similar rainbands are frequently observed when the Kanto plains are in the eastern quadrant of a typhoon. Some calculations are carried out concerning the effect of topographic updraft. In appendix, some calculations are made in relation to the effect of microwave attenuation upon the intensity of echo from heavy rainfall, and it is concluded that 3.2 cm radar is quite unsuitable for the observation of such heavy rainfall as in the present case. *Subject Headings:* **1. Radar-synoptic analysis 2. Mesoanalysis 3. Rainfall intensities 4. Kanto District, Japan.**—*Authors' abstract.*

RAIN, SNOW AND HAIL (551.578)

See also: **Snow loads on buildings,** 12.4-94; **Ice cap melting** (Green), 12.4–166; **Nitrogen in snow** (Wilson), 12.4–180; **Névé research, Greenland** (Landauer), 12.4–184; **Winter precip. estimation, Inverness-shire** (Reynolds), 12.4–187; **Mie theory for colloidal spheres** (Penndorf), 12.4–242; **Influence of snow cover on heat flow from the ground** (Gold), 12.4–258; **Cleansing of atmosphere by rainfall** (Junge), 12.4–269; **Water budget studies of winter snow cover, Bavaria** (Kern), 12.4–287.

12.4–281 551.324.433:551.578.462(931)

Krenek, L. O. (*Wanganui, New Zealand*), **The formation of dirt cones on Mount Ruapehu, New Zealand.** *Journal of Glaciology*, Cambridge, 3(24):312–314, Oct. **1958.** 2 figs., 7 refs. English and German summaries p. 312. **DWB, DLC**—Dirt cones formed in two different ways as a function of the heavy ablation in the summers of 1955 and 1956 when the average temperature was 3.2°F above normal. The sub-glacial ash deposits from the 1945 eruption, accumulated in shallow depressions of the ice at the Whakapapa Glacier and as the ablation proceeded the ash came to the melting surface while protecting its underlying surface which developed from an ice pillar into a cone. The ash deposits at right angles to the crevasses

formed dirt cones by being divided into parallel ridges by the down-streaming melt water. As the crevasses widened the subsiding ridges left a hummock covered surface subsequently turning into dirt cones as the inter-spaced ash disappeared. The several hundreds of dirt cones were gone in less than 2 months because of heavy and warm rains in Feb. *Subject Headings:* 1. Dirt cone formation 2. Glacial dirt cones **3. Mt. Ruapehu, New Zealand.**—*W.N.*

12.4–282 551.578.463(988)

Gerdel, R. W. and Drouet, Francis, **The cryoconite of the Thule Area.** *U. S. Snow Ice and Permafrost Research Establishment, Research Report,* No. 50, November **1958.** 12 p. 20 figs., table, 6 refs. **DWB, DLC**—The cryoconite holes on the Nuna and Thule ramps are described, and the results of analyses of their mineral and organic content are discussed in relation to their formation. The closely spaced cylindrical holes of Nuna ramp range from a few cm to more than 1 m in diam. with a uniform depth of 50–60 cm. The larger holes are found at low elevations in the wet-ice zone, and small holes (1-2 cm in diam.) occur near the firn line. The holes on the Thule ramp are less uniform, 50 cm or less wide, and 30 cm or less deep. Water fills the holes to within a few cm of the ice surface, and a gelatinous, gritty material (cryoconite) covers the bottom. Oven drying of the drip-free cryoconite yielded 93–96% water and a dry residue containing 13.2–20.1% organic matter (algae, fungi, desmids and rotifers), with the mineral fraction consisting of fine sharp grains, apparently wind-transported over short distances. The holes may be at least partly the product of energy released from photosynthesis and metabolism of the algae (the largest fraction of the organic matter), since algae primarily utilize radiation in the blue region from 0.40–0.65 where ice has the greatest transmissivity. The organisms are identified, and the algae are described in detail. *Subject Headings:* **1. Firn formation 2. Cryoconite holes 3. Thule, Greenland.** —*SIPRE abstract.*

12.4–283 551.578.7

Berenbeim, D. Ia. and Kochkarev, G. N., **Neobychnyĭ grad.** [Unusual hail.] *Meteorologiia i Gidrologiia,* Leningrad, No. 7:41, July **1958. DWB, DLC.** Transl. into English by Geraldine Kline, issued by American Meteorological Society, under Contract AF 19(604)-1936, May **1959.** 1 p. Complete.—On July 19, 1957 showers with hail accompanied by thunder were observed on the Kerch District. The showers fell from 11:08 o'clock to 12:35 o'clock and produced 35 mm of precipitation. The hail continued from 12:15 o'clock to 12:30 o'clock. Together with hail of ordinary diameter of 5–10 mm there fell pieces of ice 50–80 mm in diameter; weights of 350 and 410 grams were recorded. Hail with a maximum diameter of 20 mm was shaped like acorns and had a dull nucleus in the center. Hail greater than 20 mm consisted of ice spheres 3–5 mm that had frozen together and a dull nucleus in the center. The hail was associated with a cold front passage in the Kerch District; the air temperature dropped 9–10°C. *Subject Headings:* **1. Hailstorms 2. Hailstone size 3. Kerch District, U.S.S.R.**—*I.L.D.*

12.4–284 551.578.7

Krupnyĭ grad. [Unusual hail.] *Priroda,* Moscow, No. 1:89–91, Jan. **1960.** 3 figs. **DLC**—Five letters describing thunderstorms with hailstones of unusual size or shape that occurred in 1958 and 1959 mainly in the southern part of European U.S.S.R. are cited in this article. *Subject Headings:* **1. Hailstone size 2. Thunderstorms 3. European U.S.S.R.** —*A.M.P.*

HYDROMETEOROLOGY (551.579)

See also: **Soil moisture measurement** (Borel), 12.4–203; **Floods during cyclones, Madagascar,** 12.4–239; **"Dead" horizon and water regime of soils** (Iroshnikov), 12.4–327; **Hydrology symposium** (Leyton, Green), 12.4–328.

12.4–285 551.579:551.482(492)

Latour, J. H. M. (*Netherlands*), **Quelques observations sur le régime de l'écoulement de petites rivières aux Pays-Bas.** [Some observations on the runoff regime of small rivers in the Netherlands.] (In: I.U.G.G. Association of Scientific Hydrology, **Symposia Darcy, Dijon,**

Sept. 1956 [Proceedings], Vol. 3. pub. (1957?). p. 222 227. 4 figs., table.) DWB (M79 I61sym)—Small river basins in the southern part of Limbourg, Netherlands, have been studied during 1948–1953, in order to determine the meteorological factors affecting them. The report contains the characteristics of the precipitation, evaporation, temperature, wind and the vegetation conditions that influence the climatic cycle as well as the inundation of the rivers and their basins. The river discharges at Berkel and Dinkel indicate a steady rising curve during the winter of 1954. *Subject Headings:* **1. Runoff regime 2. Meteorological effects on runoff 3. Limbourg, Netherlands.**—*N.N.*

12.4–286 551.579:551.510.721

Menzel, Ronald G. (*Ag Res. Serv., U. S. D. A., Beltsville*), **Transport of strontium-90 in runoff.** *Science*, Wash., D. C., 131(3399):499–500, Feb. 19, **1960.** 2 tables, 4 refs. **DLC** – Only a small portion of the strontium-90 that fell on cultivated soils was removed in runoff. The concentration of strontium-90 was usually about 10 times higher in the soil carried by the runoff than in the soil from the plow layer of the plots. Thus a considerable concentration of Sr^{90} could occur in areas where runoff sediments accumulate. *Subject Heading:* **1. Strontium^{90} removal by runoff.**—*Author's abstract.*

12.4–287 551.579.2:551.578.46(433)

Kern, Helmut, **Wasserhaushaltsuntersuchungen in der winterlichen Schneedecke einer randalpinen Tallage.** [Water budget studies of a winter snow cover in a peripheral Alpine valley.] *Germany. Deutscher Wetterdienst, Berichte*, 8(54):150–154, **1959.** 4 figs., 3 refs. German summary p. 150. **DWB, DLC**—The author describes a platform at ground level with a surface area of 2.5×2.5 m placed upon a slab in a valley 820 m NW of Walchen Lake. The platform was set up by the Bavarian Office of Hydrology. Upon this platform an undisturbed snow cover was deposited. Daily weighing and meltwater determinations facilitated the analysis of precipitation, water content of the snow cover and evaporation losses. The experimental procedure is outlined and the result of water budget studies carried out during the three successive winters of 1955–1958 are discussed with the aid of graphs of the simultaneous variation of air temperature, precipitation and runoff. It is shown that in the peripheral Alpine valley almost all the precipitation falling during the winter appears as melt water so that no significant loss by evaporation from the snow cover occurs. Larger evaporation losses occur only from the ground after mass melt when the air temperatures are positive. *Subject Headings:* **1. Water budget 2. Snow cover 3. Walchen Lake, Bavaria.**—*I.L.D.*

12.4–288 551.579.4(477.9):061.3

Gol'din, B. M. and Ivanov, B. N., **Konferentsiia po selevym potokam v Krymu.** [Conference on flash floods in Crimea.] *Vsesoiuznoe Geograficheskoe Obshchestvo, Leningrad, Izvestiia*, 91(1):104–105, **1959. DLC**—The conference was organized by many local Soviet scientific organizations including: The Soviet on Study of Productive Forces, Crimean Division of the Geographic Society, Office of Hydrometeorological Services and other organizations of the Ukrainian U.S.S.R. Twelve papers, presented on various subjects related to flash flood control in different regions (Crimea, Caucasus, Carpathia, etc.) are briefly reviewed. Various suggestions concerning future work are briefly discussed and recommendations adopted to encourage scientific experts (on geology, geography, botanical agriculture, climatology, geomorphology, etc.) and students studying various sciences in universities and colleges, to carry out practical work in fields related to the problem of flash floods. *Subject Headings:* **1. Flash floods 2. Flash flood conferences 3. Ukrainian U.S.S.R.**—*N.P.S.*

12.4–289 551.579.4:551.509.329

Lambor, Julian (*Prof., Polytechnique, Warsaw*), **Classification des types de crues de l'Europe centrale et leur prévision.** [Classification of the types of floods in Central Europe and their prediction.] (In: I.U.G.G. Association of Scientific Hydrology, **Symposia Darcy, Dijon, Sept. 1956 [Proceedings]**, Vol. 3, pub. (**1957?**). p. 37–44. 3 tables.) **DWB** (M79 I61sym)—A systematic study of the four basic types of floods in Europe is made. Their characteristics, causes, occurrences and their duration periods are described. *Subject Headings:* **1. Flood classification 2. Flood forecasting 3. Central Europe.**—*N.N.*

12.4–290 551.579.5:628.11

*Filippova, A. K., **Otsenka uvlazhnennosti vodosborov po zapasam vlagi v pochve.** [Evaluation of moisture supply in basins from soil moisture amounts.] *Leningrad. Gosudastvennyĭ Gidrologicheskiĭ Institut, Trudy*, No. 63:44–62, **1958.** 4 refs., fig., 10 tables, 4 eqs. **DLC**—In order to obtain accurate data on the soil moisture content of catchment basins as a whole from data on moisture content at several points at their surface, the author has examined extensive material on soil moisture and has developed recommendations for determining the necessary number of points of observation (hole drillings) for estimating the number of holes and their disposition over an area in order to obtain the soil moisture content with a given degree of accuracy. The reliability of the mean soil moisture content is evaluated by the statistical method of small samples by means of which it is possible to calculate the error resulting from a few determinations of the mean soil moisture reserve and hence to establish the boundaries between which lies the true value of the soil moisture of a given territory. The determination of the necessary number of borings depends upon the distribution of the moisture reserves in the territory, i.e. the mean square deviation σ of the moisture reserve. The value is obtained either from mass observations of moisture reserves or surveys of moisture for a uniform distribution of borings over a territory. An example illustrating the determination of σ, the error of a sampled mean value z_m, etc. are presented with the aid of relevant formulae. The results of analysis of observations on soil moisture in catchment basins located in different geographic zones are presented. These zones include the following: steppe zone (Sal Steppe, Rostov Region), forest steppe zone and forest zone. *Subject Headings:* **1. Soil moisture determination 2. U.S.S.R.**—*I.L.D.*

CLIMATOLOGY AND BIOCLIMATOLOGY

CLIMATOLOGY (551.58)

See: **Statistics in climat.** (Lebedev), 12.4–11; **Agroclimat. handbooks,** 12.4–15; **Arctic survival guides** (Innes-Taylor), 12.4–17; **Soil formation, Arctic** (Tedrow, Cantlon), 12.4–19; **Climate, Queen Maud Land** (Doyen), 12.4–25; **National climatological activities 1953–1957** (WMO), 12.4–39.

CLIMATIC ZONES (551.581)

See: **Climate, U.S.S.R.** (Borisov), 12.4–9.

CLIMATE OF PARTICULAR PLACES (551.582)

See also: **Climat. probabilities, U.S.S.R.** (Lebedev), 12.4–11; **Climate, Antarctica,** 12.4–21; **Climate, Antarctica** (Tauber), 12.4–29; **Climatic maps of Ethiopia, Eritrea and the Somalilands** (Grimes), 12.4–46; **City planning** (Böer), 12.4–88; **Climate, Natl. Reactor Testing Station, Idaho** (De Marrais), 12.4–98; **Freezing temps. in late spring and early fall** (Pierce), 12.4–257; **Glazed frost map of Transcaucasus** (Chirakadze), 12.4–273.

12.4–291 551.582:551.585(728.6)

Coen P., Elliott, **Climas de Costa Rica.** [Climates of Costa Rica.] *Ciudad Universitaria, San Jose, Costa Rica.* April 16, **1958.** 13 p. map. "Conference given in Faculty of Sciences and Letters, Section of Geography and History of University of Costa Rica." **DWB** (M82.1/7286 C837cl)—General remarks on climate, solar energy, atmospheric phenomena, observation stations, macro- and microclimate, and on the climatic maps for Costa Rica showing thermal provinces, rainfall limits, hydrologic balance, evapotranspiration and limits of rainfall regime are presented in the Statistical Atlas of Costa Rica (1949). The treatment leans heavily on KÖPPEN. No actual data or maps are presented in this report. *Subject Headings:* **1. Climatic zones of Costa Rica 2. Costa Rica.**—*M.R.*

12.4–292 551.582(673):003.1

Houk, Richard J. (*Dept. of Geog., DePaul Univ., Chicago*), **Recent developments in the Portuguese Congo.** *Geographical Review*, N. Y., 48(2):201–221, April **1958.** 8 figs., foot-refs.

DWB, DLC—Climatic contrasts in the three geographic areas of Angola: 1) Coastal lowlands, 2) Broad sub-plateau (1000 to 4000 ft) and 3) Central plateau (4000–4900 ft) are pointed out in this article on the present and future agricultural and economic prospects of the Portuguese Congo. The climate itself, while a deterrant to development, is not as serious a factor as is isolation or poor roads and transportation. The economy is based almost entirely on coffee growing; so diversification is important for future development. Heat and humidity are the climatic factors retarding development, but the plateau, while hot, is not as bad as the coastal valleys. *Subject Headings:* **1. Climate and economic development 2. Angola.**—*M.R.*

12.4–293 551.582(728):581.9

†Lauer, Wilhelm, **Klimatische und pflanzengeographische Grundzüge Zentralamerikas.** [Climatical and phytogeographical outlines of Central America.] *Erdkunde*, Bonn, 13(4):344–354, Dec. **1959.** 3 figs., table, 65 refs. English and German summaries p. 344. **DLC**—As regards its plant cover, Central America occupies a special position among the tropical countries of the world. Although in its horizontal and vertical zonation the vegetation is adjusted to the tropical climatic conditions, as regards species, it shows flora elements from boreal areas. The paper investigates first the climate of the area, which appears as genuine tropical "diurnal" climate up to the highest altitudes. The vegetation is arranged into climato-ecological zones and altitudinal belts according to the thermical altitudinal zones (annual isotherms) and the number of humid or arid months, respectively (isohygromens). The floristic investigation shows a more pronounced presence of holarctic and neoarctic elements in the north of the area. Many tropical mountain flora elements have their limit in Costa Rica. Some reach as far as the Mexican mountains. The main reason for the abrupt interruption of plant migration from north or south is the great gap of the mountain range between Honduras and Costa Rica. To sum up, the special position of Central America as regards plant geography is characterized by the striking contrast between climatic ecological unity and floristic diversity. *Subject Headings:* **1. Climate of Central America 2. Plant geography of Central America 3. Central America.**—*Author's abstract.*

12.4–294 551.582(52) 551.5:361.9

Saito, R.; Arai, T. and Miyazaki, M. (*all, Japan Met. Agency, Tokyo*), **The climate of Japan and her meteorological disasters.** *Geophysical Magazine*, Tokyo, 28(1):89–105, Aug. **1957.** 11 figs., 4 tables, 13 refs. **DWB, DLC**—This article is a general survey of an extensive period to determine what is the normal climate and what are its anomalies. Discussing the general characteristics of climate, the authors compare the climatic data of five stations in Japan with those in America for the corresponding latitude of each station from north to south. The climate of Japan is of marine character and is under the strong influence of the Asian winter monsoon; high precipitation is mostly brought by the Bai-u and typhoons. Aerology of six seasons (winter, spring, Bai-u, summer, Shurin'rainy season between summer and autumn, and autumn) is also considered in terms of general circulation at the upper atmosphere, corresponding to the season at the surface. Finally, the meteorological damages were classified according to the causes and ranking, frequency, and monthly statistics were tabulated with comments on seasonal damage. The abnormality resulted from the unusual coolness and cloudiness in summer which was caused by the abnormally prolonged stagnation of Bai-u front. *Subject Headings:* **1. Climate of Japan 2. Climatic data 3. Meteorological disasters 4. Weather data comparisons 5. Japan.**—*K.C.*

12.4–295 551.582(571)

*†Sliadnev, A. P. and Fel'dman, Ia. I., **Vazhneĭshie cherty klimata Altaĭskogo kraia (bez Gorno-Altaĭskoĭ AO).** [The most important features of the climate of Altai Territory, not including the Gorno-Altai Autonomous Region.] *Osobaia Kompleksnaia Ekspeditsiia po Zemliam Novogo Sel'skokhoziaĭstvennogo Osvoeniia, Trudy*, Vol. 1:9–61, **1958.** 17 figs., 27 tables, 43 refs. **DWB**—A fairly comprehensive analysis of the climate of the Altai Region, excluding the high mountain area, giving historical studies of climate from VOEĬKOV (1914) to date. The climatic influence (seasons, ground conditions, radiation, circulation) and peculiar conditions of summer conditions of natural regions, effect of altitude, forests, and a brief agroclimatic

analysis for various crops and products, are given with many illustrative maps, charts, cross sections, diagrams and analytical tables. *Subject Headings:* **1. Climate of Altai Region 2. Altai Region, U.S.S.R.**—*M.R.*

12.4–296 551.582:551.577.32:551.573(485)

Tamm, Olof, F. S., **Bidrag till kännedomen om det superhumida klimatet i Sydvästsverige.** [Contribution to the knowledge of the super humid climate of southwest Sweden.] *Ymer*, Stockholm, 79(1):1–21, **1959.** 4 figs., table, 12 refs. German summary p. 21. **DWB**—Swedish climatic types, with humidity value (H) >600 mm, are defined as super-humid. In his work of 1954, the author showed that the annual mean value of evapotranspiration (E) could be computed from the annual mean temperature (T). The function $E=30.4\ T+220.9$. Correlation coefficient 0.937 ± 0.024 was based on data from 25 precipitation regions of Swedish rivers. The refined function $E=28.1\ T+225$. Correlation coefficient 0.909 ± 225 was based on 53 precipitation regions. E can be computed by the expression $P-E$, where P is the annual mean precipitation 1921–1950 and the difference yields the humidity value (H). The potentialities of H to characterize the climate anywhere in Sweden, where P is valid, is here exemplified and discussed in relation to the super-humid regions of southwest Sweden. The results are presented in a table and mapped. *Subject Headings:* **1. Climate of southwest Sweden 2. Precipitation – Evaporation (P – E) 3. Sweden.**—*W.N.*

12.4–297 551.582.2/3(52)

*Japan. Meteorological Agency, **Climatic tables and maps of Japan. 1957.** 13 p. 11 figs., 7 tables. **DWB** (M82/52 J35cL)—This booklet was prepared for foreigners visiting Japan and also for those who are interested in the climatic and natural conditions of the country. The climate is generally temperate, the summers are hot and winters cold. There is a rainy season also, marked sometimes by great disasters. In order to make the information handy, the booklet contains eleven figures and seven tables to represent the characteristics of the climate of Japan. The climatic data used in the tables and maps are the normal values calculated as a rule for the period 1921–1950. *Subject Headings:* **1. Climate of Japan 2. Climatic data 3. Japan.**—*I.S.*

12.4–298 551.582.2(63)

*Fàntoli, Amilcare, **Contributi preliminari alla climatologia dell'Etiopia, III, Neghelli, Bonga, Lechèmti, Oletta, Dessiè.** [Preliminary contribution to the climatology of Ethiopia, Pt. 3, Neghelli, Bonga, Lechèmti, Oletta, Dessiè.] *Rivista di Meteorologia Aeronautica*, Rome, 20(1):3–32, Jan/March **1960.** 20 figs., 21 tables. Italian, French, English and German summaries p. 3. **DLC**—New data, concerning important places of Ethiopia (Neghelli, Bonga, Lechèmti, Oletta, Dessiè) are published here as a supplement to those already published in this review. Although the data include only some of the meteorological elements they, nevertheless enable one to draw a picture of the most peculiar weather factors. For the greater part of the places considered, we had up to now no precise knowledge. *Subject Headings:* **1. Climate of Ethiopia 2. Ethiopia.**—*Author's Summary.*

12.4–299 551.582.2:551.577(569.4)

*Israel. Meteorological Service, **Climatological Normals, Pt. 1, A, Rainfall.** 2d ed. Its [*Publications*], *Ser. A, Meteorological Notes*, No. 3A, **1958.** 20 p. map, numerous tables, 2 refs. Text and t-p. in Hebrew and English. (For abstract on 1st ed., 1952, *see* 4.1–217, Jan. 1953, *MAB.*) **DLC, DWB**—The first edition (Part I) published in 1952 gave normal precipitation data for 150 stations, more detailed data for 44 stations and temperature, humidity, evaporation and cloud data for 21 stations, all normals reduced to those for 6 stations having a complete 30 year record for the IMO period 1901–30. The second edition gives rainfall monthly and annual data for the new WMO normal period 1921–50, using data for 36 stations with 25 or more years record out of the 30, and data for 200 stations with 10–25 years reduced to the 30 year period for the other 36, and in preparing the isohyetal map of Israel, data for 240 more stations in Palestine with only 4–10 years record (reduced to 1921–50) were used. Data for number of rain days for 1938–48 (≥ 0.1 mm + ≥ 1.0 mm.) are also tab-

ulated. *Subject Headings:* **1. Normal precipitation data for Israel 2. Israel. I. Krauthammer, H. II. Walther, S.**—*M.R.*

12.4–300 551.582.2(969) 551.587

McCreary, Frank E., Jr., **A Johnston Island climatological study.** *U. S. Joint Task Force Seven, JTFMC* TP-17, Aug. **1959.** 21 p. 6 plates, table. At bottom of preface: Joint Task Force SEVEN Meteorological Center, Pearl Harbor, T. H. **DWB** (821.1/969.4 U585jo)—The study provides a factual tabulated summary and graphical illustrations of the available climatological records for Johnston Island (16°44′N and 169°31′W). The discussion preceding the tabulated weather summary gives a brief account of Johnston weather including the consideration of tropospheric and stratospheric circulation. The report considers approximately 10 years (April 1945–July 1955), surface record obtained from a summary prepared by the Data Control Division, Directorate of Climatology, Air Weather Service, U. S. Air Force and approximately nine years (Jan. 1950–Sept. 1958) of upper air records obtained from a standard winds aloft summary prepared by National Weather Records Center, Ashville, North Carolina. *Subject Headings:* **1. Climate of Johnston Island 2. Upper air climatology 3. Johnston Island.**—*I.S.*

12.4–301 551.509.318(46) 551.582.2:551.589(46)

*Zimmerschied, Wilhelm (*Wiesbaden*), **Acerca de las situaciones típicas de tiempo de la Península Ibérica.** [Typical weather situations in the Iberian Peninsula.] *Spain. Servicio Meteorológico Nacional Publicaciones, Ser. A. Memorias,* No. 20:5–13, **1959.** Transl. into Spanish of his **Über typische Wetterlagen der Iberischen Halbinsel,** in *Meteorologische Rundschau,* 1(13/14), **1948.** Also his **Acerca de la relación entre las cantidades de precipitatión en la Peninsula Ibérica y la crudeza del invierno en la Europa Central.** [Relation between the amount of precipitation in the Iberian Peninsula, and the severity of winter in Central Europe.] *Ibid.,* p. 15–20. table, 6 refs. **DWB**—A discussion of typical weather conditions in Spain and Portugal. Compared with Germany where numerous synoptic weather "types" are easily distinguished at all seasons (refs. by Flohn), the weather of Spain is more stable. Two main types are described, that of winter and that of summer. Fine weather (summer type) which may occur in spring is first described. Then the stormy type (may occur in summer, but usually in spring or autumn) and finally, the bad weather types of winter are related to the relative position of anticylones, air mass movements and stability, orographic and sea-land effect. The second paper is a Spanish translation of his **Über den zusammenhang zwischen der Niederschlagsmenge auf der Iberischen Halbinsel und der Strenge der Winter in Mitteleuropa** (*see* 4–61, April 1950, *Met. Abstracts*). The author finds correlation of +.775 between Jan. precipitation at Madrid and sum of negative mean daily temperatures at Berlin, and a smaller correlation between Berlin temperature and precipitation at Santiago de Compostello in NW Spain, where orographic rain is much heavier than at Madrid. The correlation is striking since both the precipitation and severity index vary widely from year to year, and in most cases the very warm winters in Berlin correspond with dry winters in Spain. However, Jan. 1936, the wettest winter at Santiago and second wettest at Madrid, was the warmest in Berlin. *Subject Headings:* **1. Synoptic weather types 2. Climate of Iberian Peninsula 3. Precipitation correlation 4. Winter temperature 5. Spain 6. Portugal.**—*M.R.*

12.4–302 551.582.3:551.524.37(764)

Blood, Richard D. and Hildreth, R. J., **Late spring and early fall low temperatures in Texas.** *Texas. Agriculture Experiment Station, College Station, Texas, Miscellaneous Publication, No.* 298, Aug. **1958.** 12 p. 13 figs. **DWB** (M24.32/764 T355L2) –Charts show isochrones of first occurrence of 32°F in the fall and last in the spring, dates in spring or fall after or before which there is a 20% chance of 32°F; dates in fall before which there is a 5% chance of 32°F, average number of days between last occurrence of 28°F in the spring and first in the fall, probability of 32°F and 28°F in the fall and spring. Remarks on relations between temp. and damage to vegetation are found in the text. Study is based on records for 94 stations in Texas with 9 to 30 years of record. There is a variation of nearly 2 months in frost dates, in both fall and spring, from NW to SE Texas. There is also considerable local variations where

frost pockets occur. *Subject Headings:* **1. Frost statistics charts 2. Frost probabilities 3. Texas.**—*M.R.*

12.4–303 551.582.3:551.552(26)

Sorkina, A. I., **Karty vetrovykh poleĭ dlia moreĭ i okeanov i eksperimental'naia proverka metodiki ikh postroeniĭ.** [Maps of wind fields over the seas and oceans and the experimental verification of methods of preparing them.] *Leningrad. Gidrometeorologicheskiĭ Institut. Materialy konferentsii po probleme Vzaimodeĭstvie atmosfery i gidrosfery v severnoĭ chasti Atlanticheskogo Okeana*, Vol. 1, pub. Leningrad, **1958.** p. 47–53. 4 tables, 9 refs. **DWB**—The calculation of wind waves and wind currents requires wind characteristics in the form of wind charts, which have to be constructed from isobar charts, since wind observations over open seas and oceans are lacking. In order to calculate wind waves from wind currents of variable dimension, isobar charts must be constructed for the movement immediately preceding the wave calculation during the time when the wind direction is constant. The isobar charts must also show all existing pressure situation within the period of time (storm, expedition) of the wind waves. In order to obtain the climatic characteristics of a wind wave regime two types of wind wave charts are constructed, namely typical and extreme charts. It is possible to compute only wind flow established for a given period of constant wind or the resultant for a period of variable wind action. The initial isobar charts must be averaged for the corresponding time interval. For sufficiently long periods during which synoptic situations and associated wind flow are constant the isobar charts averaged for this period may be used to compute the wind flow. In order to obtain the climatic characteristics of the wind current regime three types of charts must be calculated, namely, charts of wind currents prevailing over an average secular period during any months or seasons, charts of mean secular water mass transport for corresponding months or seasons and typical charts of distribution of wind currents. The transition from isobar charts to wind field charts is the same, regardless of the original form of the isobar charts. From the computed gradient winds, the wind at the water surface is determined by means of the theoretical model of M. E. Berliand for computing change of wind with height. The computed results were verified by statistical averaging of observations on wind over open seas, (20,000 observations) and they show a satisfactory agreement between the two. Data are presented on the ratio of wind velocity at 6 m over sea surface to gradient wind as a function of atmospheric stratification and as a function of wind velocity; ratio of wind velocity at 13 m above sea level to wind velocity at 6 m is a function of atmospheric stratification and angles of wind deviation above sea surface from the isobars as a function of atmospheric stratification. *Subject Headings:* **1. Wind field above the ocean 2. Wind field charts.**—*I.L.D.*

CLIMATIC CHANGES (551.583)

See also: **Climat. changes** (King), 12.4–183; **Climat. change, Marie Byrd Land** (Wexler), 12.4–185.

12.4–304 551.583:581.056:634.94(798)

Oswalt, W. H., **Tree-ring chronologies in south-central Alaska.** *Tree-Ring Bulletin*, Tucson, Ariz., 22(1/4):16–22, Dec. **1958.** 5 figs., table, 9 foot-refs. **DWB**—The analysis of a selected sample of white spruce cores from south-central Alaska demonstrates that two chronologies exist; the widespread Series A Dating and the purely local chronology. The former ring chronology is characteristic of spruce growing at tree-line on most mountain sides in interior and south-central Alaska as well as at tree-line on the Arctic coast where the tundra and taiga meet. Thus, in sensitive trees similar ring patterns may be found as much as 600 mi apart. Perhaps still more remarkable is the fact that, judging from a preliminary statement by Giddings, spruce from the western shore of Hudson Bay have chronology characteristics like those of Series A Dating. The localized chronologies are probably linked to local microclimatic factors and may upon a refinement of interpretive techniques, offer an index to past localized summer temperatures. *Subject Headings:* **1. Dendrochronology 2. Tree ring growth 3. Alaska.**—*Author's abstract.*

12.4–305 551.583:551.4

†Regel, Constantin von, **Die Klimaänderung der Gegenwart in ihrer Beziehung zur Landschaft.** [Climatic variations of the present in their relationship to the landscape.] *Bern, Francke Verlag,* **1957.** 135 p. tables, foot-notes and refs. p. 127–135. (*Dalp-Taschenbucher,* Vol. 335.) **DWB**—The main aspects of climatic variation which have been discussed, are as follows: climate, landscape, vegetation, animal kingdom, soil, temperature of sea water, land-locked water levels, salinity of the Baltic Sea and its fauna, glaciology, causes of the climatic changes, climatic fluctuations, and man's influence on climate. Regions other than northern Europe and Asia are mentioned only occasionally. A bibliography pertinent to the separate subjects is provided. *Subject Heading:* **1. Climatic variations.**—*W.N.*

12.4–306 551.583:551.324.63:591.9 523.74:598.2:591.54

Stechow, Eberhard (*Radebeul b. Dresden*), **Über kosmische Einflüsse auf die Organismenwelt.** [Cosmic influences on the animal world.] *Forschungen und Fortschritte,* Berlin, 39(12):353–356, Dec. **1958. DLC**—The different directions in which the mountain chains run in the Eastern (east to west) and Western (north to south) Hemispheres resulted in different movements of glaciers. In the case of the New World, animals could retreat southwards as the glaciers advanced. In the case of the Old World, the simultaneous advance of glaciers on the Alps, Pyrenees, etc. did not allow the animals much opportunity to flee. This situation accounts for the greater diversity of life in the northern part of the Western Hemisphere as compared with the Eastern Hemisphere. As a result of the advance of the Scandinavian and Alpine glaciers the animal world of Central Europe was divided into two halves, one being displaced towards the southwest and the other to the southeast. The various species of animals and plants were isolated for very long periods under different climatic conditions. Those in the milder climate flourished; in the case of birds a great diversity of feather colors developed. Those in the continental climate were subject to more severe natural selection; here the birds acquired monotonic coloration. In post-glacial time these species came into contact and mixing occurred. This accounts for the presence of two different counterparts to the same species in Central Europe while in the east and west only one of each exists. Various examples of this phenomenon are cited for birds, mammals, etc. Supposed instances of the response of certain bird cycles to the 11–11½ sunspot cycle observed by the author in the case of the fir jay and also of migration of mammals and even the migration of peoples around 375 B.C. are discussed in reference to effect of sunspot cycles upon climate. *Subject Headings:* **1. Climatic change effects on animal distribution 2. Animal distribution.**—*I.L.D.*

12.4–307 551.583.1(984)

Hesselberg, Th. and Johannessen, T. Werner (*both, Det Norske Met. Inst., Oslo, Norway*), **The recent variations of the climate at the Norwegian Arctic stations.** (In: Polar Atmosphere Symposium, Oslo, July 2–8, 1956, **Proceedings, Pt. 1, Meteorology Section.** N. Y., Pergamon Press, **1958.** p. 18–29.) Also issued in *Journal of Atmospheric and Terrestrial Physics,* London, Special Supplement, Pt. 1, **1957.** p. 18–29. **DWB, DLC**—In the Atlantic sector of the Arctic the following Norwegian stations have been in operation since 1912: at Spitsbergen, 1920 at Jan Mayen, 1921 at Bjørnøya, 1922 at Myggbukta and since 1946 at Hopen. World War II destroyed all stations, but Jan Mayen was in operation for the Allies a couple of months after the destruction. With this background, the climatic observations are discussed, stressing the longer sequence of data from the Spitsbergen station. The amelioration of Arctic weather evidently coincided with the general rise of temperature as observed in the 1870s. The comparative rise of temperature as shown in tables, graphs and illustrations from Spitsbergen, is explained by the retreat of the inner Arctic area toward north; thus exposing Spitsbergen to mild S and SW cyclonic winds displacing the very cold surface layers of air as produced by outgoing radiation. The mean temperature increase at Spitsbergen during 1917–22 was 7°C in winter, 3°C in spring, 2°C in summer, 3° in the autumn and 4°C for the whole year. *Subject Headings:* **1. Climatic variations 2. Norwegian Arctic.**—*W.N.*

12.4–308 551.583.14:551.524.34:551.577.34(73)

*Landsberg, Helmut E. (*U. S. W. B., Wash., D. C.*), **Note on the recent climatic fluctuation in the United States.** *Journal of Geophysical Research,* Wash., D. C., 65(5):1519–1525, May

1960. 4 figs., 2 tables, 7 refs. **DLC**—The monthly, seasonal, and annual temperature means and the annual precipitation totals are compared for the two 25-year periods 1906–1930 and 1931–1955. The data from rural stations with homogeneous records were used. The temperatures in most places show significant rises. Annual rises of 1.5°F are noted over the Great Lakes region and in the mountain states. The average of 48 stations shows an annual rise of 0.8°F between the two time intervals. For the most part, precipitation changes are probably not significant, but a tendency toward lower totals is noted over the mountain states, parts of the Great Plains, and in a sector west of the Appalachians. *Subject Headings:* **1. Climatic variations 2. United States.**—*Author's abstract.*

12.4–309 551.583.2(52):581.056:634.94

Arakawa, Hidetoshi (*Met. Res. Inst., Tokyo*), **Japanese tree-ring analyses.** *Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. B*, Vienna, 10(2):210–212, **1960.** 2 figs., table, 5 refs. English, German and French summaries p. 210. **DWB, DLC**—Two Japanese tree-ring charts extending over eight centuries are reproduced and it is concluded that the effect of the climatic factors on old trees, if any, is in general so complex that these difficulties can hardly be overcome in these humid lands. *Subject Headings:* **1. Tree ring studies 2. Japan.**—*Author's abstract.*

12.4–310 551.583.3:551.526.6(261/268)

Ewing, Maurice and Donn, William L. (*both, Lamont Geological Obs., Palisades, N. Y.*), **On pleistocene surface temperatures of the North Atlantic and Arctic Oceans.** *Science*, Wash., D. C., 131(3393):99, Jan. 8, **1960.** 4 refs. **DLC**—Two additional interpretations are given for the important data of D. B. Ericson on the correlation of coiling directions of *Globigerina pachyderma* in late Pleistocene North Atlantic sediments with ocean surface temperatures. One interpretation relates the distribution of this species to the distribution and circulation of ocean water masses. On the basis of our Ice Age theory, our second interpretation uses the data and correlations of Ericson to establish temperature limits of a thermal node, a line on which glacial and interglacial temperatures were equal, for the North Atlantic Ocean. This line crosses the strait between Greenland and Scandinavia. Further, Ericson's interpretation of the 7.2°C isotherm implies the glacial-stage surface waters of the Arctic Ocean were between 0° and 3.5°C. *Subject Headings:* **1. Pleistocene ocean temperatures 2. Ocean circulation variations 3. Paleontological correlations 4. North Atlantic 5. Arctic Ocean.**—*Authors' abstract.*

12.4–311 551.583.2/3:551.311

†Pidoplichko, Ivan Grigor'evich and Makeev, P. S., **O klimatakh i landshaftakh proshlogo, Vyp. 3.** [Climates and landscapes of the past, Vol. 3.] Kiev, Akademiia Nauk Ukrainskoĭ SSR, **1959.** 140 p. 10 figs. (1 fold.), numerous foot-notes, refs. at end of each ch. At head of t-p.: Akademiia Nauk Ukrainskoĭ SSR, Institut Zoologii. **DWB** (M83.7 P612ok)—The author discusses the facts of geological, paleoecological and biological nature, which ascertain the existence of continental (not mountain) glaciation somewhere on the earth at any time of its development. However, he maintains that the problem of the so-called glacial period, one of the most intricate and complicated problems of contemporary science, can be solved only by a concerted and coordinated effort of the representatives of various branches of science. In this connection a reference has been made to the essence of V. V. Dokuchaiev's system of natural zones and L. S. Berg theory of landscapes. The author discusses further the question of climates and landscapes of the Cretaceous period, other periods of the Mesozoic era, and presents a picture of the distribution at that time of 3 climatic types: Boreal, Mediterranean and Austral, depending on climatic conditions. *Subject Headings:* **1. Glacial periods 2. Climatic zones 3. Historic climates.**—*A.M.P.*

MICROCLIMATOLOGY (551.584)

See: **Snow house microclimates** (Innes-Taylor), 12.4–17; **Air pollution-weather relationships, Vienna** (Steinhauser), 12.4–204; **Dew formation on various objects** (Long et al.), 12.4–272.

CLIMATIC CLASSIFICATION (551.585)

See also: **Atlantic Ocean influence on weather, U.S.S.R.** (Semenov), 12.4–12; **Climat. zones, Costa Rica** (Coen P.), 12.4–291.

12.4–312 551.585:551.515.8

†Brunnschweiler, Dieter H., **Die Luftmassen der Nordhemisphäre.** [Air masses over the Northern Hemisphere.] *Geographica Helvetica*, Bern, 12(3):163–195, **1957.** 16 figs., 63 refs. English summary p. 195. **DWB** (M13.2 B897Lu), **DLC**—Problems of climatic classification are reviewed. Among the possible classification schemes utilizing dynamic criteria (i.e., synoptic features), air masses are chosen as a valuable device for distinguishing climatic regions of the earth. From 6 years (1933–37, 1949) of daily Northern Hemisphere historical weather maps, the frequency of occurrence of 6 air mass types (A, mP, cP, mT, cT, E) was determined at 164 well-distributed stations; in addition means and extremes of some basic weather elements were obtained for each air mass, at 60 of the locations. Maps are presented for every other month of the year showing regions with >80, 50–80, 20–50 and <20% occurrence of specified air masses. The data from the Jan. and July maps are then combined and plotted on a single map to show areas that are essentially monosomatic (one air mass type predominating) or polysomatic. Air mass diagrams, called "somograms," containing data on the frequency of air mass types and averages of associated weather elements are given for 6 selected stations (Tokyo, Valentia, Chicago, Matochkin Shar, Calcutta, Honolulu). The hemispheric air mass data are analyzed further in terms of all observed combinations of types—mono- and polysomatic, on both a seasonal and annual basis; 28 combinations are found occurring in 35 "aerosomatic provinces" of the hemisphere. A more detailed analysis along these lines is then given for Europe. It is finally suggested that with the increasing availability of weather maps for the Southern Hemisphere, a genetic classification of the world's climates might become possible through further development of the aerosomatic concept. *Subject Headings:* **1. Northern Hemisphere air masses 2. Climatic classification.** —*R. S. Quiroz.*

12.4–313 551.585(811) 551.586:63

Camargo, Felisberto C. (*Dir. Serviço Nac. de Pesquisas Agronomicas, Rio de Jan.*), **Report on the Amazon Region.** (In: UNESCO, **Problems of humid tropical regions.** Pub. Paris, UNESCO; London, H. M. Stationery Office, **1958.** p. 11–24. 5 figs., 2 tables, 16 refs. French summary p. 23.) **DLC** (SB111.U56)—Of the global hot humid climate regions 1/5, or about 5 million sq km, are found in the Amazon region, the flood plains of which are under water from 5 to 7 months of the year. Tabulated water gage readings at Manaus and Santarem for the period 1931–1952 show a difference of 8–10 in. between flood and low water level. A canal system is in progress, with good results obtained in regard to soil reclamation and animal husbandry. The prospects of the much needed immigration to colonize a territory whose density is but one person per two sq km have also improved. SEREBRENICK's climatic map No. 7 features a region designated as TIU (tropic iso-superhumid) according to his own system rather than the Köppen system recommended for general adoption. It also contains a discussion on the rubber economy and problems involved in the economic life of the region. An account is given of many agricultural research bodies contributing to the development of the Amazon region. *Subject Headings:* **1. Humid tropics research 2. Amazon Region.**—*W.N.*

12.4–314 551.585:631.44

Shul'gin, A. M., **Sostoianie izucheniia klimata pochvy v SSSR.** [Status of the studies on soil climate in the U.S.S.R.] (In: *U.S.S.R. Glavnoe Upravlenie Gidrometeorologicheskoĭ Sluzhby*, **Voprosy agrometeorologii,** ed. by F. F. Davitaia and M. S. Kulik. Moscow, **1958.** p. 82–84. 15 refs.)—Recent studies on soil climatology in the U.S.S.R. have established relationships between soil climate and soil zones and attempts have been made to establish soil climatic regions in different territories and to set up a classification of soil climates. Thus a rather close relationship between the distribution of soil types and magnitude of the climatologic index of moisture has been established for Kazakhstan, the southern part of Western Siberia and the Central forest-steppe and steppe regions of the U.S.S.R. The region and

geography of soil moisture in the different natural zones of the U.S.S.R. and the geographical distribution of soil temperatures have been investigated. A classification of types of soil climate based upon soil temperature and soil moisture and their annual variation has been proposed for different territories. The mechanism of action of the external environment upon soil climate and the microclimate of soil during the warm season have been studied. During the past 10-years considerable research has been devoted to the temperature regime of the surface layer strata of the soil under snow cover and under winter crops; the temperature regime of the soil at the depth of stem formation of winter crops (3 cm from the soil surface), the effect of snow cover including time of formation density, etc. Effect of absolute minimum of air temperature, etc. has been investigated for various regions. Work on the dynamics of soil moisture in relation to plant development in different geographic zones of the U.S.S.R. has led to the establishment of optimum and critical values of productive soil moisture for different crops and their developmental phases. These studies have led to the evaluation and forecasting of moisture supplies for crops. Studies on the optimum and critical values of soil temperature of crops have also been carried out. Investigations have shown the effectiveness of regulating soil climate by snow cover control and thereby attaining the soil climate in continental regions and rendering the soil more moist in spring. *Subject Headings:* **1. Soil climates 2. Climatic analysis 3. U.S.S.R.**—*I.L.D.*

12.4–315 551.585.1(435.1):551.586:633

Thran, Peter (*Schleswig*), **Zur Beurteilung der Anbauwürdigkeit von Gräsern und Leguminosen im Küstenklima Schleswig-Holsteins.** [Evaluation of the value of growing grasses and legumes in the coastal climate of Schleswig-Holstein.] *Annalen der Meteorologie*, Hamburg, 8(11/12):340–343, **1959.** 3 figs., 4 refs. German summary p. 340. **DWB, DLC** — The effect of climate or weather upon the yield of grasses and legumes along the coast of Schleswig-Holstein is investigated by constructing an isokarp diagram (equal yield diagram) which shows the yield per hectare as a function of rainfall amount and heat sums during the growth period. A single combination of both weather elements proves to be the optimum for the yield; all yields below the record are associated with other combinations of weather elements. The cultivation value of any variety can be judged by means of such isokarp diagrams. The reason for the low yields of grasses and legumes along the coast of Schleswig-Holstein was investigated by constructing an agroclimagram for the various varieties of grasses and clover growing in this region. The agroclimagram, on which annual air temperature and annual precipitation are coordinates provides the optimal meteorological variables for individual varieties. A sketch map showing the distribution of the grasses best suited to the climate of Schleswig-Holstein is presented. *Subject Headings:* **1. Weather effects on crop yields 2. Schleswig-Holstein, Germany.**—*I.L.D.*

12.4–316 551.585.53:551.453:63(08)

Cheng, Kenneth T. C., **Conquest of deserts in recent history of science.** *Meteorological Bulletin*, Taipei, Formosa, China, 5(4):12–17, **1959.** 8 refs. In Chinese; English summary p. 12. **DWB, DLC**—This is a concise report of the discussions in the symposium of UNESCO which was held at New Delhi in 1957. The writer first gives a general introduction on the formation of desert and the importance of the utilization of arid lands. The content of this paper mainly deals with the discussions under the following headings: 1) climatic variability in arid regions; 2) utilization and reutilization of water resources in arid regions; 3) grass resources and drought resistance of plants; 4) animals in arid regions; 5) results of agricultural cultivation and immigration to arid zones. *Subject Headings:* **1. Desert research 2. Climatic variability in arid regions 3. Water resources in arid regions 4. Drought resistant plants.** —*Author's abstract.*

12.4–317 551.585.9:551.57.2:595.7(56)

†Kapur, A. P. (*Zoological Survey of India, Calcutta*), **A report reviewing entomological problems in the humid tropical regions of South Asia.** (In: UNESCO, **Problems of humid tropical regions.** Pub. Paris, UNESCO; London, H. M. Stationery Office, **1958.** p. 63–85. 376 refs. French summary p. 76–77.) **DLC** (SB111.U56)—The main entomological problems

of some of the vital crops, and forest and stored products are discussed. Also medical, veterinary and systematic entomology are dealt with. The law of "survival of the fittest" appears to be reflected by insects with resistance to chemical extinction, changed habits and taste for modern means of transportation. Systematic recordings of insects found in aircraft, apart from its entomological value, would shed light on insect dispersal particularly in relation to upper air currents. Recent estimation of known insect species in India, Burma and Ceylon exceeds 40,000 and probably an equal number has not yet been described. Before starting the insect war, it is necessary to have correct identification of insect; because it enables utilization of available information in the literature. Studies of habits, life history and natural enemies of insects in relation to climatic conditions and laboratory and local field tests that will include possible new problems are also necessary. *Subject Headings:* **1. Humid tropics 2. Entomological problems 3. Insect migration 4. South Asia.**—*W.N.*

BIOCLIMATOLOGY (551.586)

See also: **Cold effects on man** (Innes-Taylor), 12.4–17; **Climatotherapy** (Hesse), 12.4–70; **Weather effects on mortality** (Hentschel), 12.4–71; **Climatotherapy** (Harnack), 12.4–72; **Climatotherapy** (Grimm), 12.4–73; **Human bioclimatology** (Giordano), 12.4–74, 12.4–75; **Climatotherapy** (Fuchs, Hentschel), 12.4–76; **Weather effects on ragweed pollen** (Dingle et al.), 12.4–77; **Evaluation of health resort treatments** (Cordes), 12.4–78; **Recreational climat.** (Carl), 12.4–79; **Architectural climat.** (Böer), 12.4–88; **Greenhouse cooling system design** (Ash), 12.4–91; **Heating of houses** (Hader), 12.4–92; **Humid tropics research** (Camargo), 12.4–313.

12.4–318 551.586:551.524.32:551.577.32:312.1

Otto, Walter and Reissig, Gisela, **Betrachtungen zum Jahresrhythmus der Geburtenfrequenz.** [Considerations concerning the annual cycle of birthrates.] *Forschungen und Fortschritte*, Berlin, 33(4):107–111, April **1959.** 20 figs., 2 tables. **DLC**—Using extensive data on birth rates for Germany (1903–1929), the German Democratic Republic, Berlin, Zurich, etc., the authors computed an annual daily mean birth frequency and the daily mean frequency of births for every month as a percent deviation from the annual mean. The monthly daily mean was divided by the monthly mean. Curves showed a maximum of births in winter and spring and a minimum in the fall. The birth rates were subjected to Fourier analysis and the resulting curves based on conception period were compared with monthly temperature variations and precipitation variations, and a striking correspondence was observed. In winter when temperature and solar radiation are at a minimum the endocrine system of the hypophysis and gonads are more quiescent so that a 5 to 10% difference in the fall birth rate results. In the spring the temperature optimum for the gonads prevails and an increase in conceptions marked by an increase in births in winter occurs. The effect of weather conditions upon social behavior and hence upon birth rate is considered. *Subject Heading:* **1. Weather effects on birthrates.**—*I.L.D.*

12.4–319 551.586:631.417

†Laudelout, H.; Meyer, J. and Peeters, A., **Les relations quantitatives entre la teneur en matière organique du sol et le climat.** [The quantitative relationships between soil content in organic matter and climate.] *Agricultura*, Louvain, 8(1):103–140, March **1960.** 8 figs., 4 tables, 45 refs. French, Dutch and English summaries p. 136–137. **DA**—Quantitative relationships between soil organic matter and mean annual temperature have been demonstrated by JENNY for temperate countries. Similar relationships for tropical soils are calculated and discussed in this paper. An exponential relationship is also found for tropical soils but the parameters are different from those found in temperate countries. Organic matter content varies more rapidly with temperature in the tropics and there is a discontinuity in the relationship between organic matter content and temperature when one goes from the temperate to the tropical zone. This discontinuity and the difference of temperature characteristics are discussed on the basis of several theories which have already been proposed and of a new interpretation of the empirical temperature characteristic of the organic matter content. According to this discussion, the temperature optimum for humus synthesis is lower than the temperature

prevailing in most tropical soils. The comparison of the rates of organic matter synthesis and decomposition in tropical and temperate soils shows that both rates are much higher in the tropical zone. Experimental data are presented regarding the efficiency of the conversion of plant residues into soil organic matter under a tropical climate. *Subject Headings:* **1. Soil organic matter formation 2. Weather effects on humus conservation in tropical climate.**—*Authors' abstract.*

UPPER AIR CLIMATOLOGY (551.587)

See also: **Upper air climatology, Johnston Is.** (McCreary), 12.4–300.

12.4–320 551.587 551.557:551.542.1:551.509.322

*Christensen, Walter I.; Bryson, Reid A. and Hutchins, Charles W., **An experiment in stratified climatology of upper winds.** Wisconsin Univ. Dept. of Meteorology, Contract AF 19(604)-5191, Scientific Report No. 2, Feb. **1960.** 34+40 p. 8 figs., numerous tables, 6 refs. **DWB**—As an experiment in stratified climatology, a contingency technique is tested for forecasting 300 mb geostrophic winds over a central point in a given area for the month of March. Eight years of data (1950–1957), is incorporated into the forecast scheme and March 1958 is used for verification. Results are compared with other objective and subjective forecast methods with the results of this study comparing favorably with other objective methods but not surpassing the accuracy level of the Joint Numerical Weather Prediction Unit. Simplicity and rapidity of application of this contingency technique is preserved and stressed. It is believed that this method has merit and further research in this area may provide more significant results. *Subject Headings:* **1. Forecasting 300 mb geostrophic winds 2. Stratified climatology.**—*Authors' abstract.*

12.4–321 551.587(73):551.551:551.554

Ratner, Benjamin (*Office of Climatology, U. S. W. B.*), **Upper-air climatology of the United States, Pt. 3, Vector winds and shear.** *U. S. Weather Bureau, Technical Paper* No. 32, Jan **1959.** 67 p. fig., 58 charts, 3 refs., eq. **DWB**—Fifty-eight charts on the vector winds and shear of the upper air climatology in the U. S. have been discussed in this paper. The mean vector winds, the standard vector deviations, vertical wind profiles and the deviations of the vertical shear for the four seasons in the U. S. are summarized. These phases of wind motion and activities are highest or else lowest at different periods of the year. These differences are presented. *Subject Headings:* **1. Upper air climatology charts 2. Vector winds 3. Wind shear 4. United States.**—*N.N.*

ENVIRONMENTAL INFLUENCES (551.588)

See also: **Precip. measurement at mt. stations, Yugoslavia** (Pašić), 12.4–191.

12.4–322 551.588.1:551.524.32:551.577.32

Diaz, Emilio L., **Fluctuaciones en la continentalidad y en las lluvias.** [Fluctuation in continentality and in rain.] *Sociedad Científica Argentina, Anales,* 167(5/6):73–97, May/June **1959.** 5 figs., 4 tables. **DLC, DWB**—Anomalies in continentality are defined as to fluctuations of the annual range between winter and following summer temperatures. The stationality index of rainfall is based on the proportion between summer and previous winter rains. Simultaneous correlations of some importance are found between the southern Atlantic westerlies gradient and continentality in the Southern Orkneys and Southwest Africa, and also with that of subtropical South America, two years afterward. The influence of anomalies of the westerlies gradient on temperature in subtropical South America is felt mainly in winter. Multiple correlation of continentality in subtropical South America with southeast trade winds gradient (6 years before), westerlies gradient (2 years before) and stationality index of rainfall in the crop and cattle raising section in Argentina (same year), gives a 0.64 coefficient. There is an inverse and simultaneous correlation (−0.58) between annual rainfall in central Argentina and the meridional barometric gradient in southern South America, and direct

correlation (+0.44) with anomalies of pressure in tropical Atlantic. Multiple correlation coefficient is 0.70. *Subject Headings:* **1. Continentality 2. Climate of Argentina 3. Argentina.** —*Author's abstract.*

12.4–323 551.588.2:551.542

Musaelian, Sh. A., **Ob uchete vliianiia nerovnosteĭ rel'efa poverkhnosti Zemli pri opredelenii davleniia na urovne moria.** [Calculation of the influence of irregularities in the relief of the earth's surface on the determination of pressure at sea level.] *Akademiia Nauk SSSR, Izvestiia, Ser. Geofiz.*, No. 5:625–635, **1958.** 6 figs., 9 refs., eqs. **DLC.** Transl. into English in the corresponding number of its *Bulletin of the Academy of Sciences, USSR, Geophysics Series.* **DLC**—The author attempts to provide a solution of the problem of determining the planetary field of atmospheric pressures averaged over a long interval of time, given the atmospheric temperature, by considering the influence of irregularities on the surface of the earth in the formation of the climatic pressure field at sea level. The method of solution is that developed by E. N. Blinova (*Akad. Nauk SSSR, Doklady*, 92(3), **1913**). The problem is linearized by the method of small disturbances on the assumption that the atmospheric motion consists of the zonal circulation and superposed small disturbances. The solution of the linear stationary problem for a spherical earth is demonstrated. The results of computations for the Rocky Mountains, Greenland Plateau, the Himalayas, etc. are presented on charts and compared with actual maps, and a satisfactory correspondence is indicated. *Subject Headings:* **1. Orographic effects on sea level pressure 2. Pressure calculations.** —*Author's summary & I.L.D.*

12.4–324 551.588.2:551.513.2

Oi, Masamichi, **Topographic perturbation of a zonal current.** *Kyoto. Univ. Meteorological Research Institute, Meteorological Notes*, Ser. 2, No. 10, **1956.** Reprint of p. 16–31 from *Osaka. Univ. of the Liberal Arts and Education, Memoirs, Ser. B, Natural Science*, **1956.** 6 figs., 2 tables, 16 refs., 25 eqs. **DWB**—It is shown that middle-scale quasi-stationary disturbances of the middle-latitude zonal current are produced, by the forced ascent of the zonal current, not only over a mountain range (continental land masses, submarine topographies or aero-topographical barriers, etc.) but also both upstream and downstream. In other words, the remote effect of the forced ascent of a zonal current is studied on a synoptic scale. *Subject Headings:* **1. Topographic effects on zonal current 2. Zonal current perturbations.**—*Author's abstract.*

12.4–325 551.588.4:616.24 551.588.2:616.24

Jungmann, Horst (*Hamburg*), **Nachweis specifischer Klimaeinflüsse an der Nordsee und im Hochgebirge an Hamburger Patientengruppen.** [Demonstration of specific climatic effects in high mountains and at the North Sea on groups of patients from Hamburg.] *Annalen der Meteorologie, Medizin-Meteorologische Hefte*, No. 13:21–25, **1958.** 4 figs., 8 refs. **DWB**—In order to determine differing responses of pulmonary tuberculosis patients to high mountain and marine climates, effect of climate upon specific physiological responses was investigated by measuring the so-called elastic resistance of the circulatory system, ($E'=4\cdot g\cdot Pwg/QT_{fem}$) and also vital capacity, respiration rate, etc., in 132 patients at 2 to 4 day intervals during a 4-week stay, either in the east Frisian Islands or in the Tyrol. Both during rest and activity the variation of the measured elements neither increased gradually nor were they most marked in the first few days of the climatic change. The variations occurred in jumps. All individual values were closer to the normal at the end of 4 weeks than at the start of the curve. After return to Hamburg (whence the patients came) a renewed change manifested itself in both the resting and active measurements; this change is designated as "vagotonic circulation state." In contrast to blood pressure, minute volume, etc. which showed no differences in the North Sea and Alps, the elastic resistence E' (ratio of pulse rate to fundamental arterial oscillation) showed an increase among the North Sea patients and a decrease among the Alpine patients. Those patients with lower E' values on the North Sea showed a greater number of successful curves while patients with high E' responded better in the Alps. *Subject Headings:* **1. Altitude effects on tuberculosis patients 2. Marine climate effects on tuberculosis patients 3. Tuberculosis 4. Alps 5. North Sea.**—*I.L.D.*

12.4–326 551.588.6:551.556.2:551.311.

Gruzdev, D. M., **Vliianie lesnykh polos na vetrovuiu eroziiu pochv v Zavolzh'e.** [Effec of forest belts upon wind erosion in the Transvolga region.] *Pochvovedenie*, Moscow, No 9:116–119, Sept. **1957.** 3 tables, 4 refs. English summary p. 118. **DWB, DLC**—The result of an experimental study on the influence of forests upon soil erosion carried out in the Trans volga region are presented and analyzed. The soil cover of the investigated area consistec primarily of Chernozem carbonates medium thick containing moderate amounts of humus and of medium coarse structure. The prevailing winds during the 1948–1950 winters were southwesterly and south-southwesterly. The experimental plots were situated on the lee side of the forest belts. The experimental procedure is described and numerical data are presented on the effect of shelter belts upon the transport and deposition of eroded soil particles in winter; the composition of eroded particles and their content of mobile P_2O_5 and the effec of forest plantings of varying wind penetrability upon the accumulation of eroded soil particles. In Transvolga winter, wind erosion of soil consists of the transport and deposition of a large number of soil particles 1.5 mm in size and less. The curves of distribution of the quantity of the particles redeposited per unit area and depth of snow cover as a result of erosion resemble one another. The dimensions of the redeposited soil particles gradually decrease with distance from the forest belt. Forest groves on the edge of a ravine, with well and poorly aerated forest belts diminish by 3.5 to 7 times the deposition of eroded soil particles in the thalweg of the ravine while on the non-forested plots almost all the products of winter erosion are taken up by melt waters. *Subject Headings:* **1. Shelter belt influences 2. Conservation practice 3. Transvolga Region.**—*I.L.D.*

12.4–327 551.588.6:551.579.5:551.577.23

Iroshnikov, A. I., **K voprosu o "mertvom" gorizonte i obvodnenii pochv Veliko-Anadol'skogo massiva (po povodu rabot I. M. Labunskogo).** [Problem of a "dead" horizon and the water regime of the soils in the Veliko-Anadol massif, with reference to the works of I. M. Labunskiĭ.] *Pochvovedenie*, Moscow, No. 7:99–102, **1957.** table, 13 refs. **DWB, DLC**—I. M. Labunskiĭ stressed the inflow or horizontal character of the movement of the moisture from atmospheric precipitation under forest plantings, the absence of a "dead" horizon in steppe soils under forest, the accumulation of subsoil soil water under forest cover and the supplying of water to the territory adjacent to the Veliko-Anadol massif. The suppositions are examined on the basis of studies carried out by the author in 1952–1953 and an examination of Labunskiĭ's data. It is shown that the high water capacity of the upper layers of black soil is characterized by a high humus content and considerable water impermeability so that inflow movement of water cannot be favored. The growth and condition of the tree species depending considerably upon amounts of summer rainfall provide evidence against the inflow nature of water movement. Data of I. M. Labunskiĭ actually show that there is no relationship between the level of subsoil water and amount of atmospheric precipitation. Finally the data indicating the accumulation of subsoil water and the supply of moisture to the adjacent areas are not adequate. *Subject Headings:* **1. Water regime of soils 2. Soil permeability 3. Veliko-Anadol, Ukrainian S.S.R.**—*I.L.D.*

12.4–328 551.588.6:551.579(08) 551.508.79(08)

Leyton, L. and Green, F. W., **Effects of forest areas on water resources and the technique of lysimetry.** *Nature*, London, 184(4694):1184–1187, Oct. 17, **1959. DWB**—The International Association of Scientific Hydrology sponsored two symposia held between Sept. 8 and 13 at Hannoversch-Munden, Germany. One symposium discussed the influence of wooded areas on the elements of the water balance. Thirty-five papers were presented from 15 countries. Seventeen papers from 9 countries were read in the other symposium which dealt with the technique of lysimetry and the causes of error in results obtained. The present paper reports on the two symposia and gives a brief description of a two-day visit paid afterwards to German field-stations concern working in the fields of the two symposia. *Subject Headings:* **1. Hydrology symposia 2. Forest effects on water resources 3. Lysimetry symposia.**—*I.S.*

SYNOPTIC CLIMATOLOGY (551.589)

See also: **Climat. data presentation** (Mehra), 12.4 186; **Synoptic weather types, Iberian Peninsula** (Zimmerschied), 12.4–301.

12.4–329 551.589(234.3)

Rosini, Ezio, **Einige statistische Daten über die Italienischen Stationen in den Alpen im Zusammenhang mit den Wettertypen, die in Italien herrschen.** [Some statistical data on Italian Alpine stations, in connection with weather types prevailing in Italy.] *Germany. Deutscher Wetterdienst, Berichte,* 8(54):182–183, **1959. DWB, DLC**—The author reports on the classification of weather types in Italy and the Mediterranean on the basis of an analysis of dynamic weather phenomena and aerological and surface observations carried out during 1948–1953. The classification is a seasonal one, since one covering the entire year would be only approximate. For the winter season 20 weather types were established and these were grouped into 7 classes. An example of the criteria and results of the classification is presented on the basis of observations in the western Alps (Monte Fraiteve and Monte Moro), central Alps (Plan Rosa and Monte Grigna) and eastern Alps (Passo Giove and Monte Elmo). The investigation period extended from 1952–1953 to 1957. Frequencies of the 7 groups are presented. *Subject Headings:* **1. Dynamic climatology 2. Weather type classification 3. Italian Alps.**—*I.L.D.*

12.4–330 551.589:551.555.6(5–011)

*†Suda, Ken (*Japan Met. Agency, Tokyo*), **A study on the dynamic climatology of cold outbreaks in the Far East.** *Geophysical Magazine,* Tokyo, 29(3):413–461, Aug. **1959.** 34 figs., 5 tables, 32 refs. English summary p. 413. **DWB, DLC.** Also in: *Journal of Meteorological Research,* Tokyo, 10(12):1053–1060, Dec. **1958.** 8 figs., 5 tables, 8 refs. In Japanese. **DWB, DLC**—In the present work, the mechanism of persistent cold outbreaks in the Far East is studied synoptically and statistically in their relationship to the general circulation of the atmosphere. As the basic material, 5-day mean northern hemisphere surface and 500 mb charts prepared in the forecast routine of JMA are used. Construction of composite maps for selected cases of extremely low temp. in Japan revealed the existence of a well-defined cut-off low to the immediate north of Japan and the southward shift and intensification of the mean jet stream in the Far East. On the hemispherical upper-air chart, it is found that cold outbreaks are favored by a special type of the classical low-index pattern with ridges in the eastern Atlantic, west Siberia and eastern Pacific and troughs between every two of them. The reality of these features is confirmed statistically by constructing various charts of correlation field. The above findings are then incorporated to a unified scheme through dynamical considerations and a model is proposed on the mechanism of cold outbreaks. In this, the development of continental high is ascribed to the dynamic anticyclogenesis in the arctic region and the subsequent tropospheric cold advection, whereas the deepening of Aleutian low to the southward shift and intensification of the mean jet, which activate the cyclonic development to the northeast of Japan. The significance of arctic anticyclogenesis to cold outbreaks is verified statistically. It is found that the latter follow the former with a delay of several days. This can be used in the forecasting routine with a sufficient skill. Statistical and synoptic studies are made also on the relationship between zonal indices taken for various latitudinal ranges and the temp. in Japan. It is found that northward shift of the axis of strongest westerlies or the mean jet corresponds to general warmth, whereas its southward shift to coldness throughout the country, supporting our view on the mechanism of cold outbreaks. Finally, three examples of strong cold outbreaks are presented in order to show the general applicability of the conclusions reached by the above studies. *Subject Headings:* **1. Dynamic climatology 2. Cold air invasions 3. Japan.**—*Author's abstract.*

12.4–331 551.589.1:551.515.8(72)

Portig, Wilfried H., **Air masses in Central America.** *American Meteorological Society, Bulletin,* 40(6):301–304, June **1959.** 3 tables, ref. **DWB, DLC**—The data and details of this paper refer only to San Salvador, situated at an altitude of 2014 ft at 13°42′N, 89°07′W. Fourfold classification of air masses during the dry season in San Salvador is given: Arctic

air, polar air, indifferent air, and equatorial air. A table lists the qualities of the four ai masses. Later, a typical synoptic example of an air mass change is presented followed by discussion of air masses in the rainy season and tabulation of their qualities. In conclusio the importance of the qualities of air masses for aviation, navigation and general transport emphasized and the necessity to create a tropical synoptic code is pointed out. *Subje Headings:* 1. Air mass climatology 2. Air mass classification 3. San Salvador, El Salvado —*I.S.*

12.4–332 551.589.1:551.515.

Sementsova, A. R., **Vostochno-eivropeĭskaia vetv poliarnogo fronta kak faktor klimata** [East European branch of the polar front as a climatic factor.] *Vsesoiuznoe Geograficheskc Obshchestvo, Izvestiia*, 90(6):534–545, **1958.** fig., 3 refs. **DLC**—The position of the Eas European branch of the polar front based upon its frequency over this area is shown on a map This branch passes through Dnepropetrovsk, south of Kharkov and Voronezh and northeast ward, north of Kuibyshev. The front has distinctly different weather conditions on either side of it. To the northwest there are air masses with low temperature and high relativ humidity. To the southeast of the frontal line in the warm sector of cyclones there flow tropical air with a high temperature and low relative humidity so that evaporation is mor intense. The dust content of the air causes a deterioration of weather conditions. Th principal amount of rain is associated with the passage of the polar front and the lesser amoun with that of the arctic front. The frequency of cold fronts is 1–1½ times greater than that o warm fronts and occluded fronts. The area of greatest frequency of cold fronts extends sout of the Ukraine, north of Boguchar, towards Penza and east of Gorki. Warm fronts includ more easterly regions, passing most frequently through the districts Novouzensk-Aleksandrovsk Gai and east of Kuibyshev and Kazan. Occluded fronts are most frequent in the Moscow an Kalinin regions. *Subject Headings:* 1. Air mass climatology 2. Polar fronts 3. U.S.S.R —*I.L.D.*

MISCELLANEOUS

COSMIC INFLUENCES (551.590.2)

See also; Sec. C1, p. 696; **Meteor orbits** (Schubart), 12.4–109; **Electron density of meteor trails** (Weiss), 12.4–112.

12.4–333 551.590.21:551.577.34:574.6:523.74

Horáček, V. (*Czechoslovakia*), **Ein Versuch zur Feststellung einiger Faktoren des aeusseren Milieus auf die Populationsentwicklung: Dynamik der Zahlmaessigkeit der Lebewesen und Insekten.** [Attempt to determine environmental factors affecting population growth dynamics of the numbers of living organisms and insects.] *International Journal of Bio climatology and Biometeorology*, Leiden, Vol. 1 (Pt. 3, Zoological Bioclimatology), **1957.** 6 p table, 12 figs. **DWB**—A graphical comparison for several districts in Czechoslovakia is mad between curves showing the annual number of game shot (rabbits and grouse), annual area o forest damaged by insects, the annual value of Pearl's vital index and the curve of solar activity expressed by the relative numbers of sunspots. The graphs cover a period of more than 100 years. Also graphs showing the relationship of population growth and decline of game and rainfall variations are presented. It was found that population increases during periods o solar activity less intense than those associated with population decline. From the position of the maximum and minimum of solar activity it is possible to predict the following cycle of population dynamics. Rising curves showing increasing population cycles are associated with precipitation lower than that associated with descending curves of the population cycle. Also higher mean maximum and mean minimum for the summer months are associated with ascending curves of the population cycle. A detailed analysis of population cycle and pre cipitation variations for individual periods for the time interval covered (1870–1950) is given It is concluded that the fundamental meteorological element influencing population dynamics is the solar radiation. *Subject Headings:* **1. Solar radiation effects on population growth 2. Population growth cycles 3. Zoological bioclimatology 4. Czechoslovakia.**—*I.L.D.*

12.4–334 551.590.21:523.746:551.594.12

Ney, Edward P. (*Univ. Minn., Minneapolis*, 14, *Minn.*), **Cosmic radiation and the weather.** *Nature*, London, 183(4659):451–452, Feb. 14, 1959. 3 figs., 5 refs. **DLC**—Works by Forbus, Neher and Winckler, Freyer, Ney and Fowler are briefly mentioned for climatological effects of solar cycle periods. Since the flux of low-energy cosmic particles is more changed by solar cycle modulation than is the flux of high-energy particles, it is possible to present the atmospheric change of ionization in % as a function of altitude and latitude. This is demonstrated in a graph featuring the % by which ionization from 1954 sunspot min. was reduced to 1957 sunspot max., plotted against the geomagnetic latitude. Thus it is feasible now to check the relation between cosmic data and meteorological variables. *Subject Heading:* **1. Cosmic influences on weather.**—*W.N.* Ⓢ

12.4–335 551.590.24:551.510.62:621.396.1

Kanaya, Sumio and Ueno, Kiyoshi (*both, Kokusai Denshin Denwa Co., Ltd., Tokyo*), **Propagation mechanism of high frequency waves related to the annular eclipse of April 19, 1958.** *Japan. Science Council. Ionosphere Research Committee, Report of Ionosphere Research in Japan*, 12(2):188–195, June **1958.** 6 figs., 2 tables, ref. **DWB**—A discussion on the HF propagation mechanism during the solar eclipse day and on other days by using the results of measurements of field-intensity, angle of elevation and bearing. As a result of this work, it was found that ionospheric sounding at the path mid-point and measurement of angle of elevation at the receiving point, are particularly useful for studying the propagation mechanism of HF waves transmitted over a distance less than 3000 km. The increase of field-intensity at the maximum eclipse is quantitatively analyzed by taking the propagation mechanism determined into consideration and by assuming recombination as the principal process of disappearance of free electrons in the absorption layer. *Subject Headings:* **1. High frequency wave propagation mechanism 2. Annular solar eclipse, April 19, 1958.**—*Authors' abstract.*

12.4–336 551.590.24:551.524.73(48)

Spinnanger, Gunnar, **On temperature changes in the free atmosphere over southern Scandinavia during the total solar eclipse of June 30, 1954.** *Meteorologiske Annaler*, Oslo, 4(12):293–329, **1958.** 7 figs., 8 tables, 7 refs., 3 eqs. **DLC**—The paper reports meteorological data from five radiosonde stations to indicate probable temperature changes caused by the total solar eclipse in Norway and Sweden. The eclipse occurred in the middle of the day, in a 152 km broad zone and lasted for about two and one half hours. The investigation is based on 15 soundings from four Norwegian and one Swedish station. From each station three soundings are available, the radiosonde being released respectively before the first contact (ascent I), between the first contact and the maximum eclipse (ascent II), and between the maximum eclipse and the last contact (ascent III). The same type of instrument, the Väisälä (Finnish) radiosonde was used at all five stations. The paper is extensively illustrated by tables and graphs featuring temperature variations between ascent III and ascent I for the five stations. In conclusion it is observed that in comparing temperature changes, one must take into account the loss of insolation during the eclipse, the special albedo conditions at the station, the time of the day and the heights at which the observations are made. *Subject Headings:* **1. Solar eclipse effects on temperature 2. Solar eclipse, June 30, 1954 3. Scandinavia.**—*I.S.*

VISIBILITY (551.591)

See also: **Air pollution effects on visibility, Budapest** (Péczely), 12.4–217.

12.4–337 551.591:629.139.1

Best, A. C., **Runway light range as a subjective measurement.** *Meteorological Magazine*, London, 88(1044):161–170, June **1959.** 3 figs., 2 tables, 10 eqs. **DWB, DLC**—Data obtained from personal calibration with a Gold visibility meter are used to assess the variation in visual acuity of the human eye. A formula is developed relating the difference in reports of runway light range to the variation in visual acuity. *Subject Headings:* **1. Visual acuity 2. Runway light range 3. Airport visibility**—*Author's abstract.*

12.4–338 551.591.3:629.13

Best, A. C. and Fielder, E. C., **Short-period variations in visibility.** *Meteorological Magazine*, London, 89(1051):42–45, Feb. **1960.** 3 figs., **DWB, DLC**—Some autograph records of visibility at London Airport have been analyzed to show the frequency of short-period variations of visibility on occasions when the visibility is generally below 1,100 yards and is patch. In such conditions the chance of a change of 30% in visibility is about 9 after four minutes and 26% after 20 minutes, if the initial visibility is between 400 and 11 yards. If the initial visibility is between 300 and 400 yards the corresponding figures are and 39% respectively. *Subject Headings:* **1. Visibility variations 2. Airport visibil 3. London Airport, Eng.**—*Authors' summary.*

OPTICAL PHENOMENA (551.593)

See also: **Scattering of light** (Feĭgel'son et al.), 12.4–13; **Zodiacal light** (Fesenkov), 12.4–161; **Haze turbidity measurement** (Volz), 12.4–198; **Solar corpuscular radiation** (Vsekhsviatskiĭ et al.), 12.4–248; **Polarization of red oxygen auroral line** (Duncan), 12.4–358.

12.4–339 551.593.

Gäbler, Horst, **Beobachtung einer Luftspiegelung nach oben.** [Observation of a superi mirage.] *Zeitschrift für Meteorologie*, Berlin, 12(7):219–221, **1958.** 3 sketches, table. **DW DLC**—With the aid of diagrams, the author describes a mirage of the Milleschauer in t Czechoslovak Republic (Donnersberg 835 m NN, distance 71 km observed from Fichtelbe on Jan. 11, 1918). Usually the view of the Bohemian Mittelgebirge is obscured to the vi of the observer from Fichtelberg in this direction by a constant layer of haze. In the ea twilight of Jan. 11, 1918 the Donnersberg, clearly discernable and appearing unusually lar was visible above a sea of fog 750 m high. The peak appeared repeatedly above itself where the upper picture was reversed. Everything was in continuous transition, in shapeless clum up to a vertex of a double pyramid. The top was sharply bounded by a line. Towar 0815 o'clock—after sunrise—the fog lifted quickly and further observation was hindere *Subject Headings:* **1. Superior mirages 2. Mirage observations 3. Donnersberg, Czech slovakia.**—*I.L.D.*

12.4–340 551.593.

Trautmann, Ernst, **Über Luftspiegelungen der Alpen, gesehen vom Bayerischen Wal** [Mirages of the Alps seen from the Bavarian Forest.] *Germany. Deutscher Wetterdien Mitteilungen*, 3(21):**1960.** 30 p. 8 figs., tables, 10 refs., 13 eqs. German and Engli summaries p. 3. **DWB**—The theory of mirages developed by A. WEGENER takes into accou the curvature of the earth. The present paper intends to confirm this theory quantitative in the light of aerological material obtained during several mirage observations. Cited a observations of reflected images of the Alps made on the Grober Falkenstein in the Bavaria Forest. The distance between the observer and the object amounts to more than 150 k 3 upward and 4 downward mirages that appeared between 1949 and 1959 are discussed wi reference to the upper air observations of Munich, being in the line of vision. With a general good harmony between theory and observations, finally two sources of error are spotted a explained. Firstly, the starting point of the line vision lies on a mountain where the temper ture conditions differ from those in the free atmosphere. Secondly, the absolute horizontali of inversion assumed in theory, is only seldom met in nature; it is important however, with visual ray of more than 150 km. In conclusion, the weather conditions propitious to mirag are shown which should facilitate further observations of this kind. *Subject Heading* **1. Mirages 2. Alps.**—*Author's abstract.*

12.4–341 551.593/4(02

Sandakova, Ie. V. **"Nezvychaĭni" nebesni iavyshcha.** ["Unusual" sky phenomena Kiev, **1958.** 34 p. 5 figs. At head of t-p.: Tovaristvo dlia Poshirennia Politichnikh Naukovikh Znan' Ukraĭns'koĭ RSR. **DLC** (QC975.S3)—A popular booklet giving scientif explanations for such "unusual" natural phenomena as auroras, rainbows, halos, unusu

rainfalls (with colored precipitation caused by tornadoes, water and land spouts), solar and lunar eclipses, comets, meteors, etc. *Subject Heading:* **1. Sky phenomena.**—*A.M.P.*

12.4–342 551.593.5:551.574.1

Mikirov, A. E., **Ob asimmetrii indikatrisy rasseianiia prozrachnogo shara.** [Asymmetry of diffusion index of a transparent sphere.] *Akademiia Nauk SSSR, Izvestiia, Ser. Geofiz.*, No. 10:1258–1261, Oct. **1958.** 5 figs., 2 tables, 3 refs., eq. **DLC**—The coefficient of asymmetry of the diffusion index is given by the equation $\eta = F(\pi/2)/F(\pi) - F(\pi/2)$, that is the ratio of the radiation flux: $F(\pi/2)$ dispersed forward to the radiation flux dispersed backward: $F(\pi) - F(\pi/2)$. The index of scattering of a transparent sphere is expressed as $i(\beta) = (\rho^2/4)[(\tau(\beta)/2) + \rho^2(1+\cos\beta)^2(J_1(\rho \sin\beta)/\rho \sin\beta)^2]$ where $i(\beta)$ = intensity of light scattered by drops in angle direction β; $p = 2\pi r/\lambda$; $\tau(\beta)$ = term taking into account scattering index according to the laws of geometrical optics; $\rho^2(1+\cos\beta)^2(J_1(\rho \sin\beta)/\rho \sin\beta)^2$ = term taking into account diffraction part of scattering index. Values given in a table indicate that they oscillate sharply. The author maintains that $n(\rho)$ should be smooth as observed for small values of ρ_1, that is for particles that do not have diffraction coronas. An apparatus for verifying this experimentally is described by means of a diagram. The determination of n is illustrated and the results of experimental measurements are presented on a graph. *Subject Headings:* **1. Scattering function 2. Diffusion by droplets**—*I.L.D.*

12.4–343 551.593.51

Michel, H., **Le rayon vert.** [The green flash.] *Ciel et Terre*, Brussels, 74(7/8):370, July/Aug. **1958.** **DLC**—Observation of a green flash made by the author at Rhodes on May 31, 1958, at about 7:15 p.m. *Subject Headings:* **1. Green flash 2. Rhodes.**—*A.V.*

12.4–344 551.593.63:551.593.1(22)

Gordon, Seton, **A green sun after sunset.** *Meteorological Magazine*, London, 87(1035): 277–278, Sept. **1958.** ref. **DWB, DLC**—After sunset a perfect "sun" was observed low on the horizon where it had vanished. The disk of this "sun" was pale green and distinct in outline. The mock sun changed to pale pink. This phenomenon is attributed to a change in the refractive properties of the atmosphere beyond the normal horizon causing the rays from the sun to the observer to become more concave with respect to the earth. Such a change in curvature would cause an apparent elevation of the sun. The necessary meteorological condition is that the air should be considerably warmer than the sea. In addition to this phenomenon on the Island of Skye, other phenomena are cited. *Subject Headings:* **1. Green sun 2. Atmospheric refraction 3. Skye, Inner Hebrides.**—*I.L.D.*

12.4–345 551.593.63

Keppler, E. (*Inst. f. Stratosphären-Physik, Lindau*), **Halo-Erscheinungen: Erläuterungen zu einer Lichtsäule am Abendhimmel des 14. Juni 1959.** [Halo phenomena: explanation of a luminous column in the evening sky of June 14, 1959.] *Umschau*, Frankfurt a.M., 59(19): 577–578, Oct. 1, **1959.** 2 figs., 3 refs. **DLC**—A diagram of the most important halo phenomena are presented and the theoretical and experimental explanation of the halo phenomena are summarized. The author then explains the luminous column observed on June 14, 1959 between 20.00–21.20 o'clock in Northeim/Hannover, Göttingen and vicinity. It appeared at a visual angle of about 0.5°L (solar diameter) at a height extension of about 3°. A luminous column is observed when the sun it not too high above the horizon. It arises as a result of reflection of sunlight of the upper or lower base surfaces of ice prisms whose principal axes are oriented vertically but which swing about this position. Likewise the reflection of horizontally oriented ice needles rotating about their principal axis leads to the formation of luminous columns. In both cases it is essential that the relevant surfaces have all possible orientations at any moment. Hence at a particular point of the sky there will be always crystal surfaces which lie in such a way that the light reflected by them strikes an observer. All these points in the sky appear bright to the observer. They form a band that apparently passes through the sun and that is visible above and below the sun. Since the phenomena appear during a low sun position the impression of a vertical solar column arises. The part of the luminous column below the sun arises through reflection of the upper lying surfaces of the ice prism,

that above the sun through reflection of the underlying surfaces. The height of the lumin column is determined by the maximum inclination of the prism surfaces in the case of vertica oriented crystals. *Subject Headings:* **1. Halo phenomena 2. Hannover, Germany.**—*I.L.*

ELECTRICAL PHENOMENA (551.594)

See also: **F1 layer ionization** (Setty), 12.4–108; **Electron density of meteor trails** (Weiss), 12.4 112; **Electron density measurement** (Jackson), 12.4–129; **Electron density measurement** (Pineo et al.), 12.4–130; **Ionos. layer formation** (Appleton, Lyon), 12.4–141; **F2 anomalies** (Appleton), 12.4–142; **Elec. discharge in ionos.** (Holzer et al.), 12.4–144; **Origin of zodiacal light** (Fesenkov), 12.4–162; **Sferics at 50 kc** (Nakai, Suzuki), 12.4–193; **Potential gradient effects in measurement of air-earth currents** (Adamson), 12.4–205; **Cosmic radiation and weather** (Ney), 12.4–334.

12.4–346 551.594:06

Pierce, E. T. (*Vickers Group Res. Estab., Brooklands Road, Weybridge, Surrey, Englan* **Some topics in Atmospheric electricity.** *Conference on Atmospheric Electricity, 2nd, Portsmo N. H., May 1958, Proceedings*, issued **1958.** p. 5–16. 8 figs., 13 refs., 5 eqs. **DWB** (M(0 C748pr)—In recent months the author has been associated with the preparation of a sur of the present position in atmospheric electricity; this has been carried out under a U. S. Force Contract (AF 61(514)-916), and is shortly to be published. While writing a survey this kind it is inevitable that several minor points of interest, forming research noted rather t full papers, should become apparent; three such points have been selected to comprise t composite paper. The topics are treated in a general manner and not developed in any gr detail; it is questionable whether such development is indeed, in some cases, worthwhile. T three topics are incidentally almost entirely disconnected. *Subject Heading:* **1. Atmosph electricity.**—*Author's abstract.*

12.4–347 551.594.12:551.510.62:621.39

Green, H. S. (*Dublin Inst. for Advanced Studies, Ireland*), **Propagation of disturbances high frequencies in gases, liquids, and plasmas.** *Physics of Fluids*, N. Y., 2(1):31–39, Jan./F **1959.** 20 refs., 42 eqs. **DWB**—A method is developed for investigating the propagation disturbances at small amplitude in fluids from the molecular or ionic standpoint. Adopt as variables the displacements of the particles from a configuration of thermal equilibri the equations of motion are derived, in statistical form, for both classical and quant mechanics. It is shown how to apply this theory in the high-frequency region by neglect the correlation between the displacements of neighboring particles. Relaxation frequenc are defined, and it is shown that anomalous absorption and dispersion will be found in th neighborhood. Beyond the relaxation frequency the medium will show elastic or dispers properties; according to whether the thermal velocities are below or exceed the velocity propagation. A completelv ionized system will have no relaxation frequencies. *Sub Headings:* **1. Physics of fluids 2. Magnetohydrodynamics 3. Ionization effects on propa tion.**—*Author's abstract.*

12.4–348 551.594.12:621.

Shimizu, Toru (*Fukui Univ.*), **Distribution of ions around charged fine wires.** *Jour of Geomagnetism and Geoelectricity*, Tokyo, 9(2):116–118, **1957.** fig., 17 eqs. **DWB**—A gra shows the number of ions around a charged wire in a laboratory without air circulation $k=1$, and 0.5 cm/sec/volt/cm. Equations used in developing the formula are given and plained. *Subject Heading:* **1. Ion distribution around fine charged wires.**—*M.R.*

12.4–349 551.594

†Lassettre, E. N., **The determination of electron collision cross sections.** Ohio. St Univ. Research Foundation, Contract AF 19(122)-642, Scientific Report No. 1, May 19 65 p. figs., tables, 33 refs., 43 eqs. **DWB**—The theoretical basis for the interpretation electronic collision cross sections is reviewed and developed to the degree needed for the

vestigation of atmospheric gases. The determination of optical oscillator strengths from measured electronic collision cross sections is discussed in some detail and the basis for comparison of electron impact and optical spectra for both atoms and molecules is described. The technique of measurement of collision cross sections, developed prior to initiation of this contract, is reviewed and the theory is re-examined in detail especially in connection with resolution errors in the study of unresolved or continuous spectra. Some results obtained prior to the present contract are very briefly reviewed. *Subject Heading:* **1. Electron collision cross sections.**—*Author's abstract.*

12.4–350 551.594.13:551.571

Lassettre, E. N.; White, E. Roderick, **Electronic collision cross sections of water vapor.** Ohio. State Univ. Research Foundation, Contract AF 19(122)-642, Scientific Report No. 12, March **1958.** 53 p. figs., tables, 15 refs., 10 eqs. **DWB** (535.84 O37s)—A comprehensive study has been made of the absolute collision cross sections and energy spectra of water vapor at 500 volts and several scattering angles. Energy spectra of water vapor are reported at scattering angles ranging from 0.58 to 8 degrees at 500 volts incident electron energy. The excitation potentials for the four major peaks of the spectra are found to be 7.37, 10.09, 11.02, and 13.32 volts. In addition, there is a broad region between 16 and 22 volts in which the position of the maximum intensity varies from about 16.5 volts at a scattering angle of 0.58 degrees to approximately 21 volts at a scattering angle of 8 degrees. Absolute collision cross sections and differential oscillator strengths are reported for the 7.37, 10.09, 11.02, and 13.32 volt peaks, as well as for seven energy losses in the continuum at 15.25, 35.25, 45.25, 55.35, and 75.25 volts. For each transition, differential oscillator strengths extrapolated to $(\Delta P)^2=0$ are also given. The total cross section and integrated oscillator strengths were calculated for the 7.37-volt peak. A value of 0.172 atomic units was obtained for the total cross section and the integrated oscillator strength extrapolated to $(\Delta P)^2=0$ was found to be 0.061. Absolute collision cross sections and differential oscillator strengths were obtained for the 10.09-volt peak and the 55.25-volt transition in the continuum at accelerating voltages of 422 and 520 volts. The results of the present investigation are compared with those obtained by optical methods. *Subject Headings:* **1. Electron collision cross sections 2. Water vapor.**—*Authors' abstract.*

12.4–351 551.594.13:541.124.7:546.17:546.21

†Meador, Willard E., Jr. (*Ames Res. Cent. Moffett Field, Calif.*), **The interactions between nitrogen and oxygen molecules.** *U. S. National Aeronautics and Space Administration. Technical Report R-68,* **1960.** 52 p. figs., 13 tables, 30 refs., 71 eqs. **DWB**—Lippincott's delta-function model for atomic interactions is analyzed, both physically and mathematically, and extended by differentiation between K- and L-shell electrons and the introduction of a variable parameter in the expression for the delta-function strength, to cover homonuclear molecules more complex than hydrogen. In addition, modifications are made which allow treatments of diatomic, heteronuclear molecules. This theory, in conjunction with a reasonably extensive study of resonance, dispersion, and configuration interaction phenomena, as well as the use of simple quantum mechanical arguments, is then applied to the N_2-N_2, N_2-O_2, and O_2-O_2 interactions. *Subject Headings:* **1. Delta-function model 2. Quantum mechanics 3. Atomic interactions.**—*Author's abstract.*

12.4–352 551.594.13

†Subramanian, A. and Verma, S. D. (*both, Tata Inst. Fundamental Res., Bombay*), **Intensity distribution of high energy pions in the atmosphere.** *Nuovo Cimento,* Bologna, Ser. 10, 13(3): 572–590, Aug. 1, **1959.** 5 figs., 3 tables, 23 refs. English summary p. 572; Italian summary p. 590. **DLC**—The vertical intensity distribution of pions in the atmosphere, in the energy range $(10^{10} \div 10^{12})$ eV, is calculated from the energy spectrum of muons at sea level. It is found that at all depths in the atmosphere, pions should account for only a minor fraction of the intensity of nuclear active particles in the above energy range. A comparison of the energy spectrum of pions at production with the primary nucleonic spectrum leads to the result that the average inelasticity in collisions of nucleons with air nuclei, in the energy range $(10^{11} \div 10^{13})$

eV, lies between 0.5 and 0.3, it reasonable limits to the multiplicity of mesons produced in su collisions are set. It is pointed out that the generation of pions in the atmosphere may ha appreciable effect in the zenith angular dependence of muons underground, and if so, this lea to the result that pions are more efficient in producing pions than nucleons, in collisions wi air nuclei. *Subject Heading:* **1. Pion distribution.**—*Authors' abstract.*

12.4–353 551.594.221:551.576

Ishikawa, Haruji and Kimpara, Atsushi (*both, Res. Inst. of Atmos., Nagoya Univ*. **Lightning mechanism and atmospheric radiation.** *Conference on Atmospheric Electricity, 2n Portsmouth, N. H., May 1958, Proceedings*, issued **1958.** p. 583–588. 5 figs., 4 refs. **DW** (M(055) C748pr)—The nature of a cloud discharge inferred from its electromagnetic effects described in this paper. When the velocity of a fast streamer reaches a value of the order 10^9 cm/sec a clear radiation pulse with a differential wave form becomes visible on the reco The electrical quantity transferred by the fast streamer in a thundercloud is, however, ve small except for exceptional cases. So that even the large pulses can usually contribute on a little to the activation of the electrostatic field change when they present themselves groups. The effective velocity of an assumed streamer composing a cloud discharge can roughly estimated and it is the same order of magnitude as that of the positive J-stream appearing in the intervals between the strokes of a ground discharge, i.e. 3×10^6 cm/sec. Th value is, however, too small if the streamer is of the same simple character as that of an expe mental spark discharge on a small scale. Therefore, the structure of the streamer appeari in thunderclouds and producing a slow electrostatic field change must be very complex, a perhaps involves numerous small fast streamers, which may produce small pulsations, of t order of 0.01 V/m, usually appearing in association with large radiation pulses during the cour of a cloud discharge roughly 10 km or more away from the station. *Subject Headings:* **1. Ligh ning properties 2. Thundercloud discharges.**—*Authors' abstract.*

12.4–354 550.372:551.594.2

Fritsch, Volker, **Freiluftmodellversuche zur Untersuchung der geoelektrischen Blit gefährdung.** [Field model experiments on the geoelectrical lightning hazard.] *Dresde Technische Hochschule, Wissenschaftliche Zeitschrift*, 7(2):335–340, **1957/58.** Abstracted fro reprint. 6 figs., 11 tables, 10 refs. **DWB**—Influence of the geoelectrical surface structu on distribution of points of lightning stroke which led H. NORINDER and O. SALKA to sugge the existence of lightning nests is investigated by controlled field experiments. The result presented in graphs and tables, corroborate their findings. It is shown that no discharge hi a surface of poor conduction and on both sides of such a cone the density of strokes is high than over vegetation covered ground. This edge effect is stronger in the positive discharg A surface with good conduction is hit more frequently than a vegetated surface. In the ca of positive discharges the point of stroke density increases concentrically and in the case negative discharges the edges are circumscribed by zones of less density than the vegetate surface. The regularity of splitting of lightning strokes is considered. *Subject Heading* **1. Lightning hazard 2. Geoelectrical lightning.**—*W.N.*

AURORAS

See also: **Auroral effects on radio wave propagation** (Owren, Little), 12.4-18; **Auroral arcs, College** (Wescott et al.), **12.4–153.**

12.4–355 551.521.67:551.594.5:535.33:546.1

Bagariatskiĭ, B. A., **O dispersii skorosteĭ v potoke solnechnykh korpuskul vblizi Zem** [On the velocity dispersion of the stream of solar corpuscles near the earth.] *Astronomichesk Zhurnal*, Moscow, 35(2):227–229, March/April, **1958.** 4 refs., 4 eqs. English summary p. 22 **DLC**—The velocity dispersion of a corpuscular stream on reaching the earth is calculated. is shown that this is insufficient to explain the observed form of the contour of hydrogen lines auroras. *Subject Headings:* **1. Corpuscular streams 2. Auroral hydrogen lines.**—*Physi Abstracts.*

12.4–356 551.501.81:551.594.5

McNamara, A. G. (*Natl. Res. Council, Ottawa*), **An analysis of some statistical properties of auroral radar reflections and their relationships to the detection capabilities of the radar.** *Canadian Journal of Physics*, Ottawa, 38(3):425–438, March **1960.** 5 figs., 2 tables, 6 refs., 22 figs. **DWB, DLC**—A statistical model of auroral echo occurrence has been made from an analysis of observations at 48.5 Mc/s obtained over a number of years of continuous operation. The probability density distribution of auroral target cross sections (σ) has been examined experimentally, and the resulting curve fitted by simple mathematical relations. Both an inverse power law and an exponential law have been derived, of the forms $p(\sigma)d\sigma = k\sigma^{-1.67}d\sigma$ and $p(\sigma)d\sigma = (1/\sigma_m)e^{-\sigma/\sigma m}d\sigma$. These models have been interpreted in terms of distributed and localized targets, and used to analyze the echo occurrence indices and the effect which variation of radar parameters will have upon them. Both forms of the target law are useful although it is considered that the exponential form yields better agreement with observations over a wider range of the variables. *Subject Headings:* **1. Radar echoes from auroras 2. Auroral echo distribution.**—*Author's abstract.* Ⓢ

12.4–357 551.510.62:621.396.029:551.594.5

Whale, H. A. (*Seagrove Radio Res. Station, New Zealand*), **The effects of ionospheric irregularities and the auroral zone on the bearings of short-wave radio signals.** *Journal of Atmospheric and Terrestrial Physics*, London, 13(3/4):258–270, Feb. **1959.** 8 figs., 12 refs., 5 eqs. **DLC**—The nature of the observed variations in the received bearing of the signals from short-wave radio stations at various distances is discussed and the origins of some of the effects are suggested. The major part of the daily variation of bearing of stations up to about 15,000 km distant arises from the refraction of the ray in the F1-region when it is reflected from the F2-region. A discussion of the curving of the ray path by successive small changes of direction at each reflection point leads to the concept of an antipodal area replacing the geometrical antipodal point. The large changes in direction associated with the passage of a ray through the auroral regions suggest a method of plotting the shape of the absorbing parts of the auroral zone by observations at a place remote from this zone. A sample plot obtained by this method is presented. *Subject Headings:* **1. Ionospheric radio wave refraction 2. Short wave radio transmission 3. Auroral zones.**—*Author's abstract.*

12.4–358 551.593.7:551.594.51

Duncan, R. A. (*Commonwealth Sci. & Ind. Res. Organ., Camden, N. S. W., Australia*), **Polarization of the red oxygen auroral line.** *Planetary and Space Science*, N. Y., 1(2):112–114, April **1959.** fig., 6 refs., 7 eqs. **DWB**—During an aurora on 8 July 1958 the zenith 6300 Å oxygen emission was found to be about 30% plane polarized with the magnetic vector North-South. It is shown that such polarization would be expected if the aurora was excited by electrons whose predominant motion was gyration about the geomagnetic field lines. *Subject Headings:* **1. 6300 Å red oxygen line 2. Auroral polarization.**—*Author's abstract.*

12.4–359 551.521.64:551.510.536:551.594.51

Liemohn, H. (*Geo-Astrophysics Laboratory, Boeing Scientific Research Laboratories, Seattle, Wash.*), **The outer radiation belt and aurorae.** *Nature*, London, 188(4748):394–395, Oct. 29, **1960.** 2 figs., table, 10 refs. **DWB**—Rees and Reid (*Nature*, 184:539, **1959**), in order to explain an observed diurnal variation in the latitude of the hydrogen lines in aurora, suggested a model in which the position of the outer radiation belt has a diurnal variation such that the tips are always over the auroral regions at night and the day side is slightly compressed from the usual dipole shape by the solar wind. The observations of the radiation belt by the satellites are analyzed to corroborate evidence for this model. The observations, however, are limited and the agreement may therefore be fortuitous. The theory could be tested with a single satellite. *Subject Headings:* **1. Van Allen belts 2. Auroras.**—*R.B.* Ⓢ

PART II. BIBLIOGRAPHY ON UPPER ATMOSPHERE STRUCTURE (GENERAL AND 30–80 km)

By: Elemer Kiss

INTRODUCTION

The use of high altitude airplanes, rockets and satellites during the past decade for scientif and practical purposes has aroused a keen interest throughout the world in data on the vertic structure (pressure, temperature, density, mean free path, etc.) of the earth's atmosphere and t variations in this structure from the mean standard or "model" atmosphere from place to place a season to season.

Conversely, there has been a feedback to help satisfy this desire for reliable data, for the valu used for standard atmospheres and other design or working scientific data tables are no longer base on *indirect* evidence (e.g., acoustical, optical, spectroscopic, meteor trail, ionospheric, auroral radio propagation data) or on theoretical extrapolations from high level radiosonde or airpla flights which might be one or more orders of magnitude in error, but on increasingly reliable *dire* measurements as well as on more sophisticated indirect evidence than was heretofore possible (e.g. rocket or satellite drag).

In view of the above well known facts, the volume of literature on this subject is becoming unwieldy (i.e., is appearing in so many languages and so many irregular sources) that it is timely t make a systematic, if not exhaustive, survey of the most representative sources of operational a historical data on atmospheric temperature, pressure and density. In preparing this bibliograph emphasis has been placed on material containing observational *results* and papers dealing only wit instruments or methods have not been included.

The material collected (about 500 references) is divided into four parts:

1) **General works** (textbooks, major reports, model atmospheres, review articles) on atmo pheric structure above 30 km.
2) Detailed studies of the atmosphere from **30 to 80 km** (approx.) altitude.
3) Ditto for **80–300 km** altitude range.
4) Ditto for altitudes **above 300 km.**

The first two categories (about 210 references) are included in the present bibliography. Th last two categories will be the subjects of the two succeeding special bibliographies in *Meteorological and Geoastrophysical Abstracts.*

Arbitrary decisions had to be made regarding the categorization of many of the works, as ther is no clear-cut division of material at the boundaries established above. However, the subjec outlines in each bibliography should help in finding material on overlapping height ranges.

The references in the *general* categories (12D–1 to 12D–56) are arranged in reverse chronologica order (so that the most recent works are at the beginning). Items 57–82 are arranged alphabetically The references in the *specific* categories (in this case 30–80 km) are arranged in the convention chronological order so the most recent material will be found at the end.

Locations where the observations or measurements were conducted will be found in the Geo graphical Outline.

OUTLINE OF CONTENTS

SUBJECT OUTLINE

General Works
Textbooks, 12D–1 to –20
Major Reports, 12D–21 to –31
Comprehensive Articles, 12D–57 to –82
Bibliographies, 12D–3, –10, –11, –13, –15, –17, –26, –28, –30, –36, –42, –44, –50, –52, –53, –55, –65, –68, –69, –74, –76, –77, –81, –101, –107, –118, –124, –153, –168, –179, –199

Standard and Model Atmospheres, 12D–15 –32, –47, –70
Height
to 50 km, 12D–83
100 km, 12D–17
110 km, 12D–100, –209
120 km, 12D–18, –52, –53, –56,
150 km, 12D–49
200 km, 12D–2, –9

220 km, 12D–41, –44, –46, –48
300 km, 12D–37, –38, –39, –43, –54, –58
400 km, 12D–34, –45, –64
540 km, 12D–40, –42
700 km, 12D–36
800 km, 12D–35, –65, –79
1000 km, 12D–33, –63
1000 mi, 12D–55
Model
ARDC Model atmosphere, 12D–33, –36, –41, –42, –177, –201
NRL Model atmosphere, 12D–34, –100
ICAO Model atmosphere, 12D–38, –43
NASA(NACA) Model atmosphere, 12D–39, –47, –49, –52, –54, –56, –100, –115, –163, –164
Grimminger Model atmosphere, 12D–54
Knoche Model atmosphere, 12D–83
Rand Model atmosphere, 12D–108
PARAMETERS MEASURED
Temperature
Heat balance, 12D–69, –83
Inversion, 12D–94, –95, –158
Gradient, 12D–61, –70, –99, –129, –170, –210
Distribution, 12D–81, –87, –107
Vertical distribution, 12D–24, –29, –58, –64, –65, –67, –69, –71, –73, –78, –79, –100, –101, –102, –103, –110, –111, –112, –117, –120, –128, –131, –133, –148, –151, –168, –170, –174, –176, –183, –184, –200, –209
Variation, 12D–60, –122, –166, –168, –173, –197, –207
Diurnal, 12D–29, –82, –104, –130, –150, –155, –159, –199, –206
Monthly, 12D–25, –182, –190
Seasonal, 12D–69, –82, –121, –134, –135, –146, –153, –159, –182, –186, –189, –198 –206
Annual, 12D–82, –104, –123, –127, –182
Due to ozone, 12D–68, –130
Lunar, 12D–125
Latitudinal, 12D–150, 182
Ambient temperatures, 12D–27, –142, –144
Anomalies in connection with solar activity, 12D–149
Height relationship, 12D–120, –121, –126, –147, –172
Synoptic measurements, 12D–194, –203
Comparison with standard values, 12D–79, –163, –205, –210
Comparison of Soviet and American data, 12D–80
Pressure
Distribution, 12D–81, –171, –172
Vertical distribution, 12D–64, –65, –67, –78, –101, –117, –174, –175, –179, –183
Variation, 12D–197
Diurnal, 12D–82
Seasonal, 12D–82, –134, –135, –186
Annual, 12D–82
Ambient, 12D–24, –27, –144
Interrelation with temperature, 12D–77, –120
Comparison of Soviet and American data, 12D–80, –181
Density
Absolute and relative density, 12D–185
Molecular density, 12D–106
Vertical distribution, 12D–26, –64, –65, –67, –79, –108, –117, –128, –157, –165, –171, –172, –174, –183, –187
Ambient, 12D–185
Variation, 12D–61, –72
Diurnal, 12D–23, –82, –178
Seasonal, 12D–82, –105, –108, –134, –135, –177, –178, –186, –189, –201
Annual, 12D–82
Latitudinal, 12D–66, –72, –177
Synoptic measurement, 12D–194
Comparison with standard values, 12D–79, –163, –201
Comparison of Soviet and American data, 12D–80
Winds, 12D–29, –60, –62, –73, –75, –81, –94, –95, –96, –101, –119, –121, –124, –127, –133, –138, –139, –142, –143, –145, –146, –147, –148, –150, –153, –156, –162, –167, –170, –176, –180, –184, –186, –190, –197, –200, –203, –204, –206, –209
Atmospheric Composition, 12D–58, –59, –65, –80, –174, –179
Nitrogen
Dissociation, 12D–79, –81
Ozone, 12D–62, –68, –79, –84, –87, –107, –137, –167, –199, –208
Absorption, 12D–130, –199
Temperature, 12D–131, –143
Radiative temperature variation, 12D–107
Vertical distribution, 12D–208
Oxygen
Dissociation, 12D–68, –77, –79, –164, –179
Upper Atmosphere Phenomena
Airglow, 12D–64, –76, –121, –176, –179
Aurora, 12D–64, –68, –74, –121, –176
Corpuscular radiation, 12D–118, –132
Solar radiation, 12D–60, –73, –74, –75, –80, –81, –103, –118, –132, –137
Solar activity, 12D–149
Solar solstice, 12D–22
Solar spectrum, 12D–107
Van Allen belts, 12D–60
MEASUREMENT TECHNIQUES
Instruments
Bottles, 12D–60
Barothermograph, 12D–118
DOVAP, 12D–120, –141, –157, –191
Hypsometer, 12D–150
Ionization gage, 12D–27, –100
Manometer, 12D–171, –172, –174
Nylon sphere, 12D–157
Parabolic mirror, 12D–108
Photo camera, 12D–172, –176
Photoelectric counter, 12D–71

Photoelectric receiver, 12D–106
Photomultiplier tube, 12D–108
Pitot static tube, 12D–209
Pressure indicator, 12D–195
Robin balloon device, 12D–195
Sample analyzer, 12D–140
Spectrograph, 12D–68
Temperature sensor, 12D–203
Thermistor, 12D–195
Thermometer, 12D–120
Transponding sonde, 12D–195
Instrument Carriers
Balloons, 12D–74, –79, –87, –112, –121, –123, –132, –150, –165, –167
Rockets, 12D–22, –28, –31, –34, –35, –36, –44, –60, –62, –68, –76, –79, –80, –107, –112, –117, –120, –121, –126, –129, –132, –138, –140, –142, –144, –152, –162, –167, –171, –172, –174, –176, –180, –182, –186, –188, –191, –204, –205, –207, –209
Aerobee, 12D–24, –26, –48, –67, –72, –74, –101, –141, –156, –159, –170, –183, –184, –186, –198, –206
Arcas, 12D–203
Deacon, 12D–26, –165
Loki, 12D–203
Nike-Cajun, 12D–187
V-2, 12D–26, –49, –78, –94, –101, –102, –104, –109
Viking, 12D–26, –48, –67
Falling sphere, 12D–60, –141, –157, –163, –169, –187, –189, –194
Satellites, 12D–23, –35, –40, –41, –80, –210
Methods
Soundings
Acoustical, 12D–29, –44, –60, –74, –82, –86, –87, –88, –89, –90, –96, –97, –98, –104, –111, –112, –119, –127, –139, –147, –148, –151, –164, –167, –176, –180, –192, –196
Optical, 12D–98
Radio, 12D–25, –74, –106, –111, –121, –132, –138, –176
Radar, 12D–176, –203
Air sampling, 12D–140
Argus experiment, 12D–60
Skylark experiment, 12D–200
Smoke shell, 12D–74
Sodium, 12D–60, –176
Spectroscopy, 12D–44
Meteor observations, 12D–44, –74, –75, –82, –84, –105, –112, –121, –124, –132, –152, –176
Free oscillation, 12D–112
Light beam, 12D–136
Light scattering, 12D–71, –74
Searchlight, 12D–106, –108, –114, –128, –134, –161, –166, –176
Twilight method, 12D–71, –115, –158
MISCELLANEOUS ATMOSPHERIC LAYERS
Ozonosphere, 12D–69
Ozonopause, 12D–69
Chemosphere, 12D–64, –65
Mesosphere, 12D–64, –65, –160, –179, –189, –199, –203, –206
Homosphere, 12D–77
Ionosphere, 12D–57, –64, –65, –68, –69, –75, –76
Ionization, 12D–62, –68
Density, 12D–68, –117
Electron density, 12D–60, –62, –117
Temperature, 12D–68, –125
Electron temperature, 12D–113
D-layer, 12D–60, –68
E-layer, 12D–60, –68, –81, –125
F_1-layer, 12D–58, –81
F_2-layer, 12D–30, –58, –68
Thermosphere, 12D–77, –179
Exosphere, 12D–64, –65, –74
IGY, 12D–22, –23, –79, –177, –183, –184, –186, –188, –191, –193, –194, –206, –208

GEOGRAPHIC OUTLINE

NORTHERN HEMISPHERE, 12D–32, –153, –197
ASIA
India, 12D–98
Central India, 12D–111
Japan
Kagoshima, 12D–25
AUSTRALIA
Northern Territory
Alice Springs, 12D–158
South Australia
Woomera, 12D–200
EUROPE, 12D–87
Denmark
Copenhagen, 12D–122
England, 12D–151
France, 12D–129, –131
Germany, 12D–15, –109
Berlin, 12D–122, –197
Helgoland, 12D–92, –116
Italy
Vergiate, 12D–109
Norway, 12D–79, –95
Spain, 12D–79
U. S. S. R., 12D–76, –174
Central U. S. S. R., 12D–181
Novaya Zemlya, 12D–88
Moscow, 12D–193
NORTH AMERICA, 12D–173, –197, –201
Bermuda, 12D–29, –78, –96, –119, –133
Canada
N. Eastern Canada, 12D–165
Manitoba
Churchill, 12D–23, –36, –72, –183, –184, –186, –189, –191, –206, –209
Labrador Coast
Goose Bay, 12D–150, –173, –178, –190
Central America
Panama, 12D–78, –96
Panama Canal Zone, 12D–29, –119, –133

Greenland
Narsarsuak, 12D–150, –173, –178, –190
Thule, 12D–122
United States, 12D–76
Rocky Mts., 12D–147
Alaska, 12D–29, –78, –127, –133
College, 12D–106
Ft. Greely, 12D–190
California, 12D–88
Long Beach, 12D–173
Point Mugu, 12D–203, –205
Santa Monica, 12D–23, –190
Colorado, 12D–133, –139, –148
Denver, 12D–173
Lowry A. F. B., 12D–190
Wray, 12D–51
Florida, 12D–119, –133
Patrick A. F. B., 12D–150, –173, –178, –190
Hawaii, 12D–119
Idaho
Arco, 12D–91
Illinois
Chanute A. F. B., 12D–173, –178, –190
Minnesota
International Falls, 12D–185
Nevada, 12D–196
New Jersey
Belmar, 12D–146, –149, –150, –178, –190
New Mexico, 12D–96, –102, –128, –130, –133, –134, –135, –139, –144, –148
White Sands, 12D–7, –23, –48, –67, –95, –101, –126, –137, –145, –152, –156, –157, –159
Oregon
Portland, 12D–173, –190
Salem, 12D–190
Virginia
Wallops Island, 12D–163
Washington
Seattle, 12D–91
OCEANS, SEAS AND ISLANDS
Arctic, 12D–22, –198, –204
Soviet Arctic
Franz Josef Land, 12D–182
Western Pacific
Marcus Islands, 12D–25
Marshall Islands, 12D–196

TEXTBOOKS AND HANDBOOKS

12D–1 551.510.53(02)

*†Ratcliffe, J. A. (*ed.*), **Physics of the upper atmosphere.** New York, Academic Press, **1960.** 586 p. figs., tables, refs., eqs. **DWB**—This excellently edited collection of articles reviewing current knowledge of the atmosphere above 60 km, consists of 12 chapters written by well known authorities on the physics and chemistry of the upper atmosphere. Articles of particular interest to this bibliography are: Newell, Homer E., Jr., **The upper atmosphere studied by rockets and satellites** (for abstract, *see* 12D–76); Nicolet, Marcel, **The properties and constitutions of the atmosphere** (for abstract, *see* 12D–77). (For abstract on the entire book, *see* 12.4–1, April 1961, *Met. Abs.*) *Subject Headings:* **1. Upper atmosphere textbooks 2. Upper atmosphere physics.**—*E.K.*

12D–2 551.510.53(02):551.521.3:551.594.5

Vassy, Étienne (*Prof., Faculty of Sciences, Paris*), **Physique de l'atmosphère.** [Physics of the atmosphere.] Paris, Gauthier-Villars, **1956–1959.** 2 vol. Vol. 1, issued **1956, Phénomènes d'émission dans l'atmosphère** [Emission phenomena in the atmosphere]. 338 p. numerous figs., tables, eqs. Vol. 2, issued **1959, Phénomènes de réfraction** [Refraction phenomena]. 227 p. numerous figs., eqs. **DLC** (QC880.V3)—The introduction to Vol. 1 (p. 1–35), covers in detail the methods of upper atmospheric investigations, both direct and indirect (radiosonde, rockets, rockoons, etc.). The structure, physics and chemistry of the atmosphere are discussed, including the latest data obtained. The author considers 1000 km the upper limit of the terrestrial atmosphere. The Laplace theory has been compared to the results derived from various observations in determining pressure and temperature. A table containing detailed data on atmospheric structure up to 200 km is presented. In Ch. I (Vol. 1, p. 162–167) temperature, density and pressure in the auroral region are discussed. (For abstract on the entire work, *see* 11B–150, Feb. 1960, *Met. Abs.*) *Subject Headings:* **1. Upper atmosphere structure 2. Auroras 3. Atmospheric physics textbooks.**—*E.K.*

12D–3 551.5(02)

*†Khrgian, Aleksandr Khristoforovich, **Fizika atmosfery.** [Physics of the atmosphere.] 3d ed. Moscow, Gos. Izdat. Fiziko-Matematicheskoĭ Literatury, **1958.** 476 p. 218 figs., 116 tables, numerous refs., bibliog. p. 472. **DLC** (QC880.K45 1958)—Two chapters of this comprehensive text deal with problems related to the structure of the atmosphere. Ch. 5 (p. 71–90) contains a theoretical treatment of atmospheric statics and pressure. The equations of state and the barometric formula are explained and examples are given of the latter's application to both lower and higher levels. The chapter includes a graph in which the logarithm of pressure is plotted against height up to 130 km (based on rocket observations); the decrease of the log. of pressure is found to gradually level off above 80 km. A theory of pressure and density distribution extending to the exosphere

(500 km and more) is also given. In Ch. 12 (p. 217–230) temperature in the upper layers of th atmosphere is discussed. The various methods of measurement, such as acoustical sounding, meteo observation, searchlight technique, spectroscopy (ozone, aurora, airglow), rocket sounding an ionospheric measurement are discussed and representative data obtained by these methods ar presented. A synthesis of the data leads to a model in which temperature in the lower stratospher is around −50° to −70°; around 50–55 km (ozone layer) it is around 20 to 35°; above this warr layer it again decreases up to 75–80 km where it may, in some cases, be as low as −90°. Above second inversion layer around 82 km, temperature increases, reaching 3000 to 4000° at 400 km. (Fo abstract on the entire book, *see* 10.7–8, July 1959 and 11B–71, Feb. 1960, *Met. Abs.*) *Subject Hea ings:* **1. Upper atmosphere textbooks 2. Atmospheric physics textbooks 3. Upper atmospher physics.**—*G.T.*

12D–4 551.510.53(02

Massey, Harrie Stewart Wilson and Boyd, R. L. F., **The upper atmosphere.** London, Hutchin son and Co., **1958.** 333 p. 12 figs., 21 plates, 6 tables, 20 refs., 33 eqs. Price: 63 sh. **DL** (QC879.M3). Review by D. R. Bates in *Nature*, 182(4650):1629, Dec. 13, **1958.** This is one of th latest and most systematic books summarizing the current knowledge of the upper atmosphere (fro 10 mi to several hundred mi above the surface) as gained by study of geomagnetic fields, radio wav propagation, spectra, radiations; by means of balloons, rockets, explosive waves, radio, spectroscope magnetometers, meteor photographs and spectra, cosmic ray counters or chambers, artificial satel lites and other direct and indirect methods. Upper air temperature, composition, density, ionizatio cosmic radiation (UV, visible, cosmic ray and radio frequency), magnetic fields and electric current auroral and airglow phenomena, ozone changes, twilight flashes and glows, atmospheric tides, sola corpuscular streams and other elements observed are tabulated. (*Same item as* 10.8–6, Aug. 1959 and 11.B–92, Feb. 1960, *Met. Abs.*) *Subject Headings:* **1. Upper atmosphere textbooks 2. Uppe atmosphere physics.**—*M.R.*

12D–5 551.510.5

*†Kaplan, J. and Kallmann, H. Korff, **Upper atmosphere research.** California. Univ. Institut of Geophysics, Contract AF 19(604)-111, Final Report, June 30, **1957.** 250 p. numerous figs. numerous tables, numerous refs., numerous eqs. **DWB** (M21.3c 153s). First ed. was prepared b W. W. Kellogg and G. F. Schilling, pub. **1950.** Rev. ed. by J. Kaplan, G. F. Schilling and H. K Kallmann, **1955,** both eds. under title **Methods and results of upper atmosphere research.**—Variou means of investigating the physical state of the upper atmosphere of the earth are discussed. The are classified according to the sources of information, e.g., rocket flights, meteor observations, soun propagation, etc. Each method is described briefly, and typical results concerning temperatur pressure, density, composition, and winds, etc., are given. A distinction is made between th physical quantities which can be measured directly and those which can only be deduced fro observations and theories. Chapter 8 (p. 90–100) is a review of results of measurements of tem perature and wind velocity made between 30 and 180 km altitude by means of acoustical propagatio techniques. Some of the results reported by various authors (Crary, Kennedy, Cox, Whipple Guttenberg) are shown in tables and diagrams. Tables, graphs, and literature references ar part of each chapter. (*See* 6.9–9, for 1950 ed., 8.5–22, for 1955 ed.) (*Same item as* 10.2–164 an 10G–119, *Met. Abs.*) *Subject Headings:* **1. Upper atmospheric structure 2. Upper air data.**— *Authors' abstract.*

12D–6 551.507.362.1:551.510.53(02

Link, František and Neužil, Luděk, **Raketové lety a výzkum vysoké atmosféry.** [Rocket flight and exploration of the upper atmosphere.] Prague, Československá Akademie Věd, **1957.** 235 p 104 figs. (incl. photos), tables, 18 refs. **DLC** (TL782.L5)—As stated in the introduction to this book on the upper atmosphere, the use of rockets greatly facilitates upper atmospheric research but does not replace other methods of exploration. Accordingly, the authors deal with all available method of investigating the various properties of the upper atmosphere. Upper atmospheric phenomena are discussed on the basis of results reported in international literature and of original work. Th methods described include stratosphere flights, acoustical sounding, photometric and other measurements during lunar eclipses (Link contributed considerably to the development of this method) rocket launchings (based upon work in the U. S.), artificial satellites (based upon Project Vanguard) ionospheric sounding, spectroscopy (including rocket spectroscopy), etc. The upper atmospheric phenomena discussed include ozone, twilight phenomena, night sky luminescence, ionospheric phenomena, auroras, meteors, geomagnetism, structure and composition of the atmosphere, etc. The information is up to date and presented in a clear nontechnical manner for the benefit of the general public. (*Same item as* 9.11–9 and 11I–104, *Met. Abs.*) *Subject Headings:* **1. Rocket exploration of the upper atmosphere 2. Upper atmosphere textbooks.**—*G.T.*

12D 7 551.510.5:551.507.362

Vaeth, Joseph Gordon, **200 miles up; the conquest of the upper air.** 2d ed., rev. print. New York, Ronald Press Co., **1956.** 261 p. 77 figs. (incl. photos). Review by J. J. Kelly in *American Meteorological Society, Bulletin,* 38(5):307–308, May 1957. (For abstract on first ed., *see* 3.8-31, Aug. 1952, *Met. Abs.*) **DLC**—The first edition (1951) of this book contained chapters on upper atmosphere research, properties, instruments, rockets, constant level balloons, the White Sands Proving Ground, V-2, WAC Corporal, aerobee and Viking rockets. These have not been changed much in the 2nd edition except for inserting a little data obtained since 1951 on rocket biological experiments, high altitude rocket or balloon flights. Three additional chapters, however, give the latest findings or plans for high level airplane, guided aircraft, skyhook balloon, satellite, 3-stage rocket, manual balloon and space ship exploration for astronomical, astrophysical, aerial photography, meteorological, cosmic ray and other studies outside the earth's atmosphere. About 20 new illustrations, all of them excellent, are included in the new edition. Since 1951 the airplane has reached 85,000 ft (comp. 59,000 ft), and 158 mi (in 1954) for a single stage rocket (Viking II) compared with 114 mi previous to 1951. Photographs were taken up to 155 mi. Another new project (called FATSO—First Airborne Telescopic and Spectrographic Observatory) is aimed at high level spectrophotographic and telescopic observations of the planets and moon from manned balloons. It should give excellent data on planetary atmospheres, especially water vapor content which cannot be determined because of water vapor in earth's atmosphere. (*Same item as* 8.6-12, and 11I-87, *Met. Abs.*) *Subject Headings:* **1. Upper atmosphere research 2. Rocket instrumentation 3. Rocket soundings 4. Skyhook balloons 5. FATSO (First Airborne Telescope and Spectrographic Observatory) 6. Satellite observatories 7. White Sands Aerological Unit 8. White Sands, New Mex.**—*M.R.*

12D–8 551.510.535:551.507.362.1(02)

Burgess, Eric, **Frontier to space.** Foreword by the Astronomer Royal, Sir Harold Spencer Jones. London, Chapman & Hall, **1955.** 174 p. numerous figs. (incl. photos), tables, 15 refs. **DLC.** Transl. into German as **Raketen in der Ionosphärenforschung,** issued Garmisch-Partenkirchen, Deutsche Radar-Verlagsgesellschaft, **1956.** 192 p. 112 figs. (incl. photos), 11 tables, bibliog. p. 189-192 (*see* 9.1-12, Jan. 1958, *Met. Abs.*).—A highly readable book giving in 8 well illustrated chapters the latest information on rockets and rocket exploration of the high atmosphere, and the basic scientific information gained from such studies of the ionosphere, solar and cosmic radiation and the exosphere. Results gained from balloon measurements and from indirect methods are incorporated in these chapters. Evidence from meteors, the counter glow, aurora and cosmic ray measurements at the surface are especially well treated. The final chapter describes the orbital or space ship, giving many theoretical technical details which must be known and improved on before the satellite observatory becomes a reality. (*Same item as* 6.10–5, and 11I–57, *Met. Abs.*) *Subject Headings:* **1. Rocket exploration of the upper atmosphere 2. Cosmic radiation 3. Satellite observatories 4. Aeronomy textbooks.**—*M.R.*

12D–9 551.510.53(023)

Zavarina, M. V., **Atmosfera.** [The atmosphere.] Leningrad, Gidrometizdatvo, **1956.** 127 p. 16 refs., 54 figs. (incl. photos). Transl. into English available of Sections of this work. **DWB** (M10 Z39atm)—A popular-science monograph covering briefly the latest basic knowledge of the many and varied phenomena in the troposphere, stratosphere and higher layers of the atmosphere, with schematic diagrams, cross sections and photographs of instruments, equipment, observatories, expeditions, etc. The main headings are: 1) atmosphere and life; 2) meteorological instruments; 3) methods of upper air investigation (balloons, kites, sounding balloons, radiosondes, planes, stratostats, searchlights, radar, rockets and spectral analysis); 4) high atmosphere phenomena (twilight, meteors, noctilucent clouds, aurora, airglow, acoustic and radio wave propagation); 5) composition of atmosphere; 6) water vapor in the atmosphere; 7) temperature of the upper atmosphere; 8) atmospheric layers; 9) ionospheric structure; 10) outer layers of the atmosphere, cosmic rays, etc.; 11) climate of the free atmosphere over the world and to 200 km height (pressure, temperature, humidity, winds, circulation, etc.). (*Same item as* 9.8-12, Aug. 1958, *Met. Abs.*) *Subject Headings:* **1. Upper atmosphere phenomena 2. Popular science books 3. Russian textbooks.**—*M.R.*

12D–10 551.508.822(02)

*†Beelitz, Paul, **Radiosonden.** [Radiosondes.] Berlin, VEB Verlag Technik, **1954.** 136 p. numerous figs. (incl. photos), 19 tables, 85 refs., 21 eqs. **DLC** (QC876.B42)—This book represents an attempt to summarize technical knowledge of this important subject up to 1954. The treatment is very systematic. Pt. 1 deals with methods of upper air observation (from ground and from aircraft); Pt. 2, aerological measurements, temperature, humidity, pressure, upper air winds; Pt. 3, distant recording techniques (types of radiosonde telemetering and rocket-radiosondes); Pt. 4,

aerological balloons (rubber, hydrogen, etc.); Pt. 5, balloon radiosonde ascents (calibration, grou checks, release, evaluation, wind aloft measurements with radiosondes, recovery of radiosondes and Pt. 6, evaluation of upper air observations for synoptic forecasting. A good bibliography appended. Technical details are shown in diagrams, photos, etc. The historical sketch on aer logical soundings going back to FRANKLIN (1752) and ESPY (1834) and their kite experiments, or even earlier balloon and mountain measurements, is quite valuable. Recent innovations such electric hygrometers, latex and other synthetic balloons, rocket and parachute soundings, radar ar acoustical soundings are mentioned. (*Same item as* 7.1–8, and 11B–12, *Met. Abs.*) *Subject Hea ings:* **1. Radiosonde textbooks 2. Upper air observation 3. Instrument textbooks.**—*M.R.*

12D–11 551.**507.362**:551.**510.5**

*†Boyd, R. L. F.; Seaton, M. J. (*both, Univ. College, London*) and Massey, Harrie, S. W. (*eds.* **Rocket exploration of the upper atmosphere.** Special supplement (vol. 1) to the **Journal of A mospheric and Terrestrial Physics.** London, Pergamon, **1954.** 376 p. numerous figs. (inc photos), tables, refs., eqs. On t-p: Papers included in this volume were read at a conference a ranged on the Upper Atmosphere Rocket Research Panel of the United States and by the Gassi Committee of the Royal Society of London. **DWB**—About 50 articles on various aspects of rocket rocket research and knowledge of high atmosphere physics gained from rocket flights, presente at the Oxford Conference on Aug. 24–26, 1953, are published in this nicely bound book. The pape are grouped under: I. Rocket technique; II. Pressures, temperatures and winds; III. Composition high atmosphere; IV. Ionosphere, solar radiation, geomagnetic variations; V. Rocket cosmic ra measurements; VI. Laboratory studies and VII. Theory and future research. (For contents s *Met. Abs.*, 6(5):707–709, May 1955.) (*Same item as* 6.5 9 and 11B 19, *Met. Abs.*) *Subject Hea ings:* **1. Rocket research 2. Upper atmosphere physics 3. Upper air data. I. Royal Society London. Gassiot Committee II. Upper Atmosphere Rocket Research Panel (U. S.).**—*M.R.*

12D–12 551.**510.53**(02

Goody, R. M. (*St. John's College, Cambridge*), **The physics of the stratosphere.** Cambridg University Press, **1954.** 187 p. 60 figs., 17 tables, bibliog. p. 176–181, eqs. **DLC**—Ch. I, **Introdu tion** (p. 1–18) takes up the following subjects: the discovery of the stratosphere, nomenclature, scop of the monograph, and the various tools of research. In Ch. II, **Temperature** (p. 19–54) the de termination of atmospheric temperatures, densities and pressures, the methods and techniques, th instruments used, and the results obtained are discussed. Both chapters are richly illustrate The layer between that wherein "weather" plays an important role and the ionosphere (e.g., fro 12 to 80 km) is emphasized. (For abstract on the entire book, *see* 11B–54, Feb. 1960, *Met. Abs Subject Headings:* **1. Upper atmosphere physics 2. Textbooks.**—*E.K.*

12D–13 525.1/2 551.1/2551.**510.5**(08

†Kuiper, Gerard P. (*ed.*), **The earth as a planet.** Chicago, Univ. of Chic. Press, **1954.** 751 figs., photos, tables, bibliogs. throughout. **DLC**—The 15 articles collected and arranged in a logica order in this second volume of an astrophysical compendium cover the dynamics of the earth as planet, the structure of the earth's interior, the earth's crust, mountains, etc., the oceans, ge chemistry, upper atmosphere, biochemistry and the properties of the upper atmosphere that woul aid in studies of other planets or stars by analogy. Of special interest to meteorologists are th following chapters: Sverdrup, H. U., **Oceanography,** p. 215–257. Byers, H. R., **Atmosphere up t 30 kilometers,** p. 298–370. Hutchinson, G. E., **Biochemistry of the terrestrial atmosphere,** p. 427 433. Goldberg, Leo, **Absorption spectrum of the atmosphere,** p. 434–490. Whipple, Fred L **Density, pressure and temperature data above 30 kilometers,** p. 491–513. Chamberlain, J. W. an Meinel, A. B., **Emission spectra of twilight, night sky, and aurorae,** p. 514–575. Bates, D. R **Physics of the upper atmosphere,** p. 576–643. Nicolet, M., **Dynamic effect in the high atmosphere** p. 644–712. Holliday, Clyde T., **The earth as seen from outside the atmosphere,** p. 713–72 Danjon, Andrè, **Albedo, color and polarization of the earth,** p. 726–738. (*Same item as* 7.11– Nov. 1956, *Met. Abs.*) *Subject Headings:* **1. Earth as a planet 2. Upper atmosphere physics.**—*M.F*

12D–14 551.**510.53**:551.**507.362**

Newell, Homer E., Jr. (*Naval Res. Lab., Wash., D. C.*), **High altitude rocket research.** N. Y Academic Press, **1953.** 298 p. 93 figs., 37 tables, numerous refs. at end of each chap. Price: $7.5 **DLC**—In Ch. 4, **Pressures, densities and temperatures in the upper atmosphere** (p. 111–142 published results of the rocket upper air program are presented. The results obtained are reporte as they appear in the literature, without detailed critique. On the other hand, an attempt was mad to bring out the sources of error in each case and their significance. The chapter is richly illustrate and Table 16 shows the summary of the rocket atmospheric data up to 220 km. (For abstract on th entire book, *see* 5.5–7 and 11I–32, *Met. Abs.*) *Subject Headings:* **1. Upper atmosphere structur 2. Rocket research.**—*E.K.*

12D–15 551.510.5:551.511.12

†*Landolt, Hans H. and Börnstein, Richard, **Zahlenwerte und Funktionen aus Chemie, Astronomie, Geophysik und Technik.** [Tables and equations in physics, chemistry, astronomy, geophysics and technology.] 6th ed. Edited by Arnold Eucken. Berlin, Springer, **1950–1952.** Vol. 3. **Astronomie und Geophysik, 1952.** Prepared by Georg Joos; Julius Bartels and Paul ten Bruggencate. 795 p. tables, charts, figs., bibliogs. **DWB, DLC**—Ch. 328, Sec. 3281, Zusammensetzung, Druck, Temperatur der Atmosphäre [Composition, pressure, temperature of the atmosphere] by R. Penndorf is an extensive and systematic compilation of temporary data referring to temperature, pressure and density of the atmosphere. The data obtained by various kinds of methods are shown in figures and tables. The model atmospheres presented on tables with detailed information include: INA Model (Internationale Normal-Atmosphäre, accepted in Germany); Penndorf Model; Gonnerman and Stranz Model; Warfieled Model (NACA Model); and the Rand Model. (For abstract on entire work *see* 4.4–9, April 1953, *Met. Abs.*) *Subject Headings:* **1. Upper air temperatures 2. Upper atmosphere densities 3. Upper air pressure 4. Atmospheric models 5. Handbooks. I. Penndorf, R.**—*E.K.*

12D–16 551.510.53(02)

Mitra, Sisir Kumar (Calcutta Univ.), **The upper atmosphere.** 2d ed. Calcutta, The Asiatic Society, **1952.** 713 p. figs., tables, bibliog. p. 644–668, eqs. (*Asiatic Society, Monograph Series*, Vol. 5). **DLC** (QC879.M49 1952)—Ch. III, **Temperature and density distribution in the middle atmosphere** (p. 51–118) discusses how observations on abnormal sound propagation phenomena and on the luminosity of meteor trails together yield data for constructing the temperature profile of the middle atmospheric regions. Through these data a fairly accurate knowledge of the temperature distribution up to 100 km was obtained. In Ch. XI, **Temperature in the upper atmosphere** (p. 548–558) an attempt is made to estimate the temperature distribution above this level from a number of upper atmospheric observations and measurements. The results point to the existence of a region of rising temperature above the 100 km level, attaining a value of the order 1500°K to 2500°K in the region of the ionosphere. (For abstract on the entire book, *see* 11B–100, Feb. 1960, *Met. Abs.*) *Subject Headings:* **1. Upper atmosphere temperatures 2. Upper air densities 3. Textbooks.** —*E.K.*

12D–17 551.501.7(02)

†Kalinovskiĭ, Aleksandr Boleslavovich and Pinus, N. Z., **Aerologiia: metody aerologicheskikh nabliudeniĭ.** [Aerology: methods of aerological observations.] Leningrad, Gidrometeoizdat., **1951.** 452 p. 245 figs. (incl. photos), tables, foot-refs., eqs., 164 refs., p. 423–428. **DLC** (QC879.K3)—A unique textbook for students intending to pursue practical hydrometeorological or aerological work. The various chapters consist of I. History and development, especially in U.S.S.R.; II. Pilot balloon observations; III. Meteorograph and its calibration, accuracy and corrections; IV. Kite, captive, and manned balloon observations; V. Sounding (free) balloon ascents; VI. Airplane soundings; VII. Computations of meteorograph records; VIII. Radiosondes (various types described in detail and compared); IX. Radar applied to soundings; X. Measurement of vertical currents; XI. Cloud and cloud physics measurements; XII. Rocket research; XIII. Publication of aerological "yearbooks" or summaries and machine methods of computation (80 column IBM-type cards and punchers, sorters and tabulator illustrated). The detailed theory that enters into each method of observation or instrument use; calculation of data, etc.; and actual comparative values, accuracy of instrument elements, design and construction of instruments and photographs of equipment are included. The bibliography of 164 references arranged by chapters consists mainly of Russian sources, but a dozen or more German, U. S. or British references are cited. Material as recent as 1950 is included. A chapter on rockets gives comparative data for V-2 and Wac-Corporal Rocket flights and standard atmospheric data to 100 km height. The chapter on radio-location includes brief mention of radar storm detection methods. (*Same item as* 6.7–10, and 11B—67, *Met. Abs.*) *Subject Headings:* **1. Upper air observation techniques 2. Machine methods of aerological computation 3. Upper atmosphere instruments 4. Radiosondes 5. Aerology textbooks.**—*M.R.*

12D–18 551.501(083)

***Smithsonian meteorological tables.** 6th rev. ed. Comp. by Robert J. List. *Smithsonian Institution, Publication*, 4014, **1951.** 527 p. Almost entirely tables. **DWB, DLC**—The chapter **Standard atmosphere and altimetry tables** (p. 262–285) includes: ICAN (International Commission for Air Navigation) standard atmosphere; altimeter setting computation factors; NACA standard atmosphere altitude-pressure table; correction of altimeter readings for mean temperature of the air column; NACA standard atmosphere, tentative properties of the upper atmosphere; and density altitude diagram. The standard atmosphere has been extended to 300 km in 1956, the tables however furnish useful data up to 120 km. (For abstract on the entire work *see* 11A–4, Jan. 1960 ,*Met. Abs.*) *Subject Headings:* **1. Atmospheric models 2. Handbooks.**—*E.K.*

12D–19 551.510.5(02,04)

Zavarina, M. V., **Stroenie atmosfery.** [Structure of the atmosphere.] Leningrad, Gidrometeoizdat, **1948.** 54 p. 22 figs., table. **DLC**—A semipopular but critical discussion of the upper atmosphere and its structure, composition and exploration for observers all over the Soviet Union who wish to understand something about the scientific knowledge which exists today on that phase of meteorology. A historical sketch tells of work on *Aerology* published in Rome in 1642, and of numerous attempts to fly (from 906 to 1935) or explore the atmosphere by balloon or kite, airplane and radiosonde (first ascent in the world Jan. 30, 1930 at Pavlovsk near Leningrad). More recent methods for sounding the upper atmosphere are described: searchlight beams, cosmic rays, rockets (American V-2 flights are enumerated), ozone absorption of UV-rays, acoustical and radio-propagation techniques, study of meteors, auroras, noctilucent clouds, etc. An up to date model of the atmosphere to 300 km (with all the details) is presented. (*Same item as* 4.11–90, Nov. 1953, *Met. Abs.*) *Subject Headings:* **1. Atmospheric models 2. Atmospheric structure 3. Upper atmosphere research 4. Textbooks.**—*M.R.*

12D–20 551.510.53(02)

Barbier, Daniel and Chalonge, Daniel, **De la stratosphère à l'ionosphère.** [From the stratosphere to the ionosphere.] Paris, Presses Universitaires de France, **1942.** 154 p. 38 figs., 2 tables, 8 plates, 7 refs. **DWB**—A pocket-size text reviewing knowledge to date (1942) of composition, structure, electrical properties, movements, controls and effects of the upper atmosphere. Sections on ozone, the aurora, ionosphere, methods of sounding and cosmic influences are fairly technical but easily understood by the layman. Some good photographs and schematic diagrams as well as illustrative tables are included. (*Same item as* 3.1–69, and 4F–22, *Met. Abs.*) *Subject Headings:* **1. Stratosphere 2. Ionosphere 3. Upper air winds 4. Textbooks.**—*M.R.*

MAJOR REPORTS

12D–21 551.510.53:551.507.362.1:01

†Heikkila, W. J., **Summary and bibliography of high altitude rocket research between Jan. 1958 and July 1958.** *Canada. Defence Research Telecommunications Establishment, DRTE Report* No 1040, May **1960.** 65 p. 11 tables, 276 titles (annotated). At head of t-p.: Defence Research Board. **DWB** (016.551 H465sum)—This report was prepared originally for the delegates to the study conference on high altitude rocket research held at the Defence Research Telecommunications Establishment (DRTE), Ottawa, Sept. 3 to 10, 1958. The report covers the advances in the field between 1953 and 1958. The rocket programs in existence in various countries are described briefly. This is followed by chapters on pressure, temperature, and density; composition, airglow, and photochemistry; the ionosphere, geomagnetic field, and aurora; solar radiation; cosmic rays; and artificial satellites. A bibliography of 276 items, mostly with abstracts, is included as an appendix. *Subject Headings:* **1. Rocket exploration of the upper atmosphere 2. Rocket bibliographies.**—*Author's abstract.* Ⓢ

12D–22 551.506.22:551.507.362.

*Hart, Pembroke J. and Guttmacher, Ilene (*comps.*), **Flight summaries for the U. S. rocketry program for the International Geophysical Year, Pt. 1, July 5, 1956–June 30, 1958.** *International Geophysical Year,* 1957/1958. *IGY World Data Center A: Rockets and satellites, IGY Rocket Report Series,* No. 2, March 1, **1959.** 193 p. Also: **Pt. 2, May 23–Dec. 31, 1958.** *Ibid.,* No. 3, Sept. 30, **1959.** 129 p. "Flight summaries for 20 pre-IGY rockets not included in Pt. 1 and for 5 rockets planned as part of the IGY program but postponed to 1959 are included in Pt. 2." **DWB** (M07.3621 1612ro)—Preliminary results and comments on the performance of the 127 rocket firings in the eight U. S. rocketry and satellite programs are presented. It gives a description of each flight objective, the rocket-borne equipment and the ground based equipment, as well as the upper air instrumentation for each. The basic objectives for almost all of them has been to measure the intensity of radiation during solar flares, to study the Arctic ionospheric structure at a time near solar solstice, to measure temperature and winds, upper air pressures and densities of atmosphere at certain altitudes, to investigate the total cosmic ray intensity through and above the atmosphere at northern latitudes during period of maximum sunspot activity, the correlation of fluctuations of cosmic ray intensity with solar and magnetic data from ground stations, with cosmic ray data in balloon flights at different stations and to investigate the physical nature, energy, intensity, and latitude distribution of "auroral soft-radiation." The second report gives details of the remaining 99 rocket firings, including 22 fired during the 1957 period and 5 scheduled during IGY but postponed until 1959. (*Same item as* 11I–152, Sept. 1960, *Met. Abs.*) *Subject Headings:* **1. Rocket flights 2. IGY rocket program.**—*N.N.*

12D–23 551.506.7:551.506.22(712.7)

†Kellogg, William W., **Review of IGY upper air results.** *Rand Corporation, Santa Monica, Calif., [Papers]*, P-1717, June 5, **1959.** 21 p. 5 figs., numerous refs. **DLC**—Recent findings concerning conditions in the stratosphere, mesosphere, and ionosphere are discussed in that order. In the lower stratosphere, improved balloon soundings have made it possible to draw constant pressure charts up to the 10 mb level. Rapid warming processes and the use of ozone and radioactive debris as tracers are briefly discussed. For the higher atmosphere, density and pressure values obtained from rockets and satellites and compiled by KALLMANN (*Rand Papers*, 1591, Jan. **1959**) are reproduced to illustrate mean conditions. Diurnal variations in density revealed by NRL rocket observations at Ft. Churchill, and recent data on atmospheric composition from the Univ. of Michigan and NRL are discussed. In the final section, solar-terrestrial relationships are taken up, with special mention of the close correlation of 10 to 20 cm radio emanations from the sun with satellite-observed densities. (*Same item as* 11I–160, Sept. 1960, *Met. Abs.*) *Subject Headings:* **1. Upper atmosphere observations 2. International Geophysical Year 1957/1958 3. Rocket data 4. Satellite data 5. Ft. Churchill, Canada.**—*R. S. Quiroz.*

12D–24 551.551:551.510.53:551.507.362.1(985)

Spencer, N. W., **Research in the measurements of ambient pressure, temperature and density of the upper atmosphere by means of rockets.** Michigan Univ. Engineering Research Institute, Contract AF 19(604)-545, Final Report, June **1958.** 90 p. 20 figs. (incl. photos). **DWB**—The research activities were: (1) development of rocket-borne means for measurements of the ambient pressure, temperature and density of the upper atmosphere up to 90 km and (2) determination of the usefulness and accuracy of the instrumentation developed in order to secure reliable upper air data as above. The system developed and pursued by the research group is based upon the determination of the surface pressures of the nose cone, "impact" or "total head" pressure of which along with the pressure at one point of the cone wall yields the free-stream Mach number from the ratio of these two pressures. Temperature computation is obtained from knowledge of the velocity of the nose cone taken with the Mach number, and knowing the Mach number one obtains the ambient pressure from the cone wall pressure. The instrumentation of the Aerobees AF 48 and 58 as well as AM2.21 are illustrated in detail and several of the devices of the Nike-Cajun AM6.30 and 6.31 are illustrated and described. Summarization of the several research topics are given as well as graphical and tabular data on some rocket flights. Graphical presentation of thickness of rocket skin vs. temperatures are also given. (*Same item as* 11I–134, Sept. 1960, *Met. Abs.*) *Subject Heading:* **1. Rocket instrumentation.**—*W.N.*

12D–25 551.506.7(52):551.508.822(520)

*Japan. Central Meteorological Observatory, Tokyo, **Aerological data of Japan: 5-year period averages (1951–1955) radiosonde data.** March **1956.** 123 p. almost entirely tables. **DWB** (M06.7/52 J35ag 1951–1955)—In this edition, data for 1951–1955 for 11 radiosonde stations in Japan (including Kagoshima, Marcus Islands and Ocean Weather Station "Tango") are presented. The 00h and 12h average monthly height, T and number of observations are given for each standard pressure surface up to 15, 10 and in one case even 5 mb (36 km) as well as the relative humidity, dew point and extreme monthly maximum and minimum temp. and date for each level. Averages are computed in 2 different ways for 100, 80, 60, 40, 30, 20, 15, 10 and 5 mb levels: (1) average of total number of observations, and average of each year's average for that month. The lowest temp. recorded in the 5-year period was −86.2°C at 80 mb (Marcus, Feb. 11, 1957). No radiation correlations are applicable. The first radiosonde was launched in June 1938 at Fusa. (For abstract on earlier issues, *see* 4.3–46, March 1953, *Met. Abs.*) (*Same item as* 9.1–129, Jan. 1958, *Met. Abs.*) *Subject Headings:* **1. Upper air data 2. Radiosonde data 3. Japan.**—*M.R.*

12D–26 551.510.5:551.507.362.1

†*Smith, Charles P., Jr., **Summary of upper atmosphere rocket research firings.** *U. S. Naval Research Laboratory, Upper Atmosphere Research Report*, No. 21; *NRL Report*, No. 4276, Feb. **1954.** each section repaged. numerous tables and figs. (incl. photos). Bibliog., Sec. 11, p. 1–35. "Reports and papers" emanating from experiments accompany many reports. **DWB**—Noncritical information concerning the Aerobee, Deacon, V-2, and Viking rocket vehicles fired in the interest of upper atmosphere research as performed by U. S. agencies is summarized on convenient data sheets. General information about the history of upper air rocket research, the Upper Atmosphere Rocket Research Panel, the instrumenting agencies, rocket firing facilities, ballistic instruments, data recovery and rocket instrumentation is given. Firing data is presented in tabular form and an extensive bibliography of reports and journal articles is included. The observations were carried out up to 138 mi altitude. This summary is continuing publication; new information will be published periodically to replace or add to that information already in the report. *Subject Headings:* **1. Upper atmosphere research 2. Rocket research 3. Rockets.**—*Author's abstract.*

12D–27 551.507.362.1:551.510.5

Dow, W. G. and Spencer, N. W., **Measurement of ambient pressure and temperature of th upper atmosphere.** Michigan. Univ. Engineering Research Institute, Contract AF 19(122)-5. Final Report, Aug. **1953.** 76 p. 30 figs., table, foot-refs.—The general objective of the work unde subject contract is to obtain measurements of the ambient pressure and temperature of the uppe atmosphere using high-altitude rockets as research vehicles. A new method which permits a essentially point-by-point determination of ambient temperature from measured pressure valu has been developed and utilized experimentally. Resulting upper-atmosphere data are presente The equipment necessary to implement the theoretical method has been developed. The alphatro ionization gage constitutes the basic pressure-sensitive device, and provides the basis for a pressu measurement system that will measure gas pressures in the range 760 mm Hg to 10^{-3} mm H Associated equipment utilizing a gyroscope to allow determination of missile angle of attack, an many accessory pieces of equipment, less spectacular but necessary to the experiment, have bee developed. This report reviews that portion of the research which was conducted under subjec contract. (*Same item as* 5.10–50, and 111–30, *Met. Abs.*) *Subject Headings:* **1. Rocket measure ments 2. Pressure measurements in stratosphere 4. Upper air temperature data.**—*Author abstract.*

12D–28 551.510.53 550.38

†California Institute of Technology, **Upper atmospheric research.** Contract DA 36-039-sc-3 Progress Report for the Fourth Quarter, pub. March 31, **1951.** 139 p. figs., tables, refs., append **DWB**—A study was conducted to coordinate and analyze existing data on the upper atmosphe and to determine the most promising new approach to upper atmosphere problems. Topics in th study included: temperature determinations and air sampling by rockets, wind and turbulenc duration of the ionization and luminosity of meteor trails, simulated meteor trails, corpuscul influence, magnetic disturbances and ionospheric phenomena, polar-current system of magneti storms, electrojet (local intensification of electric currents manifested in the daily geomagneti variation), influence of cosmic rays, general circulation, absorption layers, air glow, and new nomen clature. (*Same item as* 6.4–112, April 1955, *Met. Abs.*) *Subject Headings:* **1. Upper atmospher research 2. Magnetic storms. I. Pickering, W. H. II. Chapman, Sydney III. Bhattachary Prabhat K. IV. Chiu, Wan-cheng.**—*TIPS, Abstract No. U18903.*

12D–29 551.596.1:551.510.5

Crary, A. P., **Stratosphere winds and temperatures from acoustical propagation studie** *Journal of Meteorology*, 7(3):233–242, June **1950.** 16 figs., 7 tables, 12 refs., equation. **DWE** Also issued as *U. S. Air Force. Cambridge Research Laboratories, Geophysical Research Paper* No. 5, June **1950.** 32 p. 21 figs., 7 tables, 12 refs. **DWB**—(*See item* J–108, Sept. 1950, *Met. Abs* Winds and temperatures at 30–60 km levels are calculated from observations made by acoustica methods in Panama, Bermuda (1948–1949), and in New Mexico and on the east coast of the U. S at other times. Results indicate lower temperatures than heretofore deduced, owing to wind facto having been neglected. East winds occur generally in summer, and west winds in Winter, ove Alaska. No diurnal variation in temperature at 30–60 km was found. (*Same item as* 8–146, Aug 1950, *Met. Abs.*) *Subject Headings:* **1. Acoustical soundings 2. Anomalous sound propagatio 3. Upper air winds 4. Upper air temperatures.**

12D–30 551.510.53:551.524.7:551.54

†*Grimminger, George, **Project Rand; analysis of temperature, pressure, and density of th atmosphere extending to extreme altitudes.** Santa Monica, Calif., Rand Corp., Nov. 1, **1948.** 14 p. 44 figs., 45 tables, 108 refs., 94 eqs. **DLC**—A compilation, mainly in tabular and graphic form of the present knowledge of the structure, composition, temperature and density of the atmospher in two major zones: below the F_2 layer, and above the F_2 layer. Three models are presented for th upper stratosphere, depending on the concept of motion of individual particles in the atmospheri gas; that is whether the particles have a limited, a large mean free path, or a completely free pat or orbit. In discussing the exosphere, special attention is given to the height of its base, the idea o *diffusion equilibrium* and the limit of the atmosphere. (*Same item as* 8–31, Aug. 1950, *Met. Abs. Subject Headings:* **1. Atmospheric structure 2. Upper stratosphere 3. Exosphere.**—*M.R.*

12D–31 551.510.53:551.501.7:551.507.362.

Beth, Eric Walter, **Discussion of a method for the investigation of pressure, temperature average molecular weight, wind velocity and dissociation in the upper atmosphere.** *U. S. Air Force. Air Materiel Command, Report*, No. 5–10, July 22, **1947.** 39 p. tables. **DWB**—Details o theoretical method for calculating wind velocity, etc. from pressure and temperature data obtaine during rocket flights to 100 km or so, based on data presented in paper by Dow and Reifman (1946) Effects of various atmospheric constituents, and determination of dissociation by this method als

discussed. Effect of projectile is taken into consideration. (*Same item as* 3.10–32, 6E-50 and 11I-1, *Met. Abs.*) *Subject Headings:* **1. Rocket measurements 2. Upper atmosphere 3. Dissociation. I. Dow, W. G. II. Reifman, Alfred.**—*M.R.*

STANDARD AND MODEL ATMOSPHERES

12D–32 551.510.5:551.511.12

*Charles, B. N., **A system of standard atmospheres.** Sandia Corporation, Albuquerque, N. Mexico, Reprint SCR-183, May **1960.** 37 p. 6 figs., 10 tables, 15 refs., eqs. "TID-4500, 15th ed." **DWB** (M(055) S217re)—A family of Standard Atmospheres is devised for defining vertical variations of temperature and pressure. These Atmospheres approximate mean conditions over Eurasia, as deduced from limited climatological data. A body of data for North America, comprising over 57,000 observations, is compared with these Atmospheres, and it is concluded that the temperature-height curves as herein defined will approximate ambient conditions over the Northern Hemisphere at least 70 percent of the time. The degree of approximation is no greater than that to be inferred from the internal consistency of the defined family of Standard Atmospheres. Tables are appended showing the temperature, pressure, and density variations with altitude in each of 12 Standard Atmospheres. *Subject Headings:* **1. Standard atmosphere 2. Vertical temperature variations 3. Pressure variations 3. Density variations.**—*Author's abstract.* Ⓢ

12D–33 551.510.5:551.511.12

Wares, G. W.; Champion, K. S. W.; Pond, H. L. et al., **Model atmospheres.** (In: **Handbook of geophysics,** ed. by C. F. Campen, Jr. et al. rev. ed., Washington, D. C., **1960.** Ch. 1 (43 p.). 11 figs., 14 tables, 12 refs., eqs.) **DWB, DLC**—Present (1959) Model represents the first version of the 1956 Model. Values of atmospheric properties are tabulated up to 700 km. Tentative values up to 1000 km are contained in dashed portions of the curves in the figures. The 3 sections in the chapter discuss: (1) atmospheric layers and their nomenclature; (2) ARDC model atmosphere 1959; and (3) extreme atmospheres. Extensive tables and graphs show the data in metric and English units. The parameters given include: pressure, density temperature, specific weight, acceleration of gravity, molecular weight, scale height, particle speed, sound speed, viscosity, kinematic viscosity, mean free path, collision frequency and number density as functions of geometric and geopotential altitudes. Arctic and tropical atmospheric properties are presented in separate tables. *Subject Headings:* **1. Model atmospheres 2. Upper atmosphere parameters. I. Cole, A. E.**—*E.K.* Ⓢ

12D–34 551.510.5:551.507.362:551.511.12

Harris, I. and Jastrow, R. (*both, Nucleonics Div., U. S. Naval Res. Lab., Wash., D. C.*), **An interim atmosphere derived from rocket and satellite data.** *Planetary and Space Science,* N. Y., London, 1(1):20–26, Jan. **1959.** 7 figs., 5 tables, 14 refs., 4 eqs. **DLC**—The analysis of radio tracking data obtained from the U. S. and U.S.S.R. satellites provides information on the density and temperature of the atmosphere at high altitudes. By combining this information with data recently obtained from rocket flights below 200 km it is possible to construct a model atmosphere which yields a determination of density up to 400 km. Above 200 km this atmosphere indicates values of temperature and density which are substantially greater than those predicted in recent extrapolations to these altitudes.They are, however, relatively close to the results of the earlier analysis by Grimminger. The model described atmospheric conditions at temperature latitudes. Adiabatic equations for the orbit elements are presented to express the relation between perigee density and the rate of change of period. The description of the model atmosphere constructed by combining the rocket data with the density data furnished by Alpha 2—is followed by the analysis of 1958 Alpha (Explorer 1) and 1958 Beta (Vanguard I) data. (*Same item as* 11I–151, Dept. 1960, *Met. Abs.*) *Subject Headings:* **1. Atmospheric models 2. Satellite data 3. Rocket data 4. U. S. satellite, 1958 Alpha (Explorer I) 5. U. S. satellite, 1958 Beta (Vanguard I).**—*E.K.*

12D–35 551.507.362:551.510.5:551.511.12

Kallmann, H. Korf (*Rand Corp., Calif.*), **A preliminary model atmosphere based on rocket and satellite data.** *Journal of Geophysical Research,* Wash., D. C., 64(6):615–623, June **1959.** 5 figs., 3 tables, 3 refs., 7 eqs. **DWB, DLC**—The scientific results obtained from rocket and satellite observations have been studied in order to determine the physical properties of the atmosphere at high altitudes. A preliminary model atmosphere is presented for the region between 100 and 800 km. The paper contains numerical tables of density, pressure, and scale height as functions of altitude. Due to solar effects these physical parameters may vary from day to night and from latitude to latitude. However, preliminary studies have indicated that average densities and pressures might vary by at most a factor of two, the variations being larger at high than at medium latitudes. Densi-

ties presented by Russian scientists, which were also obtained from rocket and satellite data, agr with the model density presented here reasonably well. The densities derived by American a Russian scientists from satellite observations agree within less than a factor of two. The densiti derived from rocket data are lower than the ones derived from satellite data for the same altitud The maximum difference between the densities derived by MICHNEVICH (1958) from rocket da and the average densities presented here occurs around 150 km, where the values differ by a fact of 3.8; above and below these altitudes the differences are much less. It is estimated that the differences then are within the limits of the variations to be expected and also within the limits of t uncertainties of the experimental data available at present. (*Same item as* 11.4–222, and 11I–15 *Met. Abs.*) *Subject Headings:* **1. Atmospheric models 2. Rocket exploration of the upper a mosphere 3. Satellite observational data.**—*Author's abstract.*

12D–36 551.510.536:551.510.3:551.507.362

*†Minzner, R. A.; Champion, K. S. W. and Pond, H. L., **The ARDC Model Atmosphere, 195** *U. S. Air Force. Cambridge Research Center, Air Force Surveys in Geophysics*, No. 115, Aug. **195** 137 p. 11 figs., numerous tables, 46 refs., 36 eqs. **DWB, DLC**—A model of the earth's atmosphe to 700 km is given. Below 53 km the present model is the same as The ARDC Model Atmosphe 1956. Above this height, changes have been made based on data deduced from rocket flights a from the rate of change of the orbital period of satellites. At approximately 600 km the new mod gives densities that are 20 times higher than the 1956 model. Below 600 km the two models gradual come closer together and finally cross at about 150 km. Between 90 and 150 km the density for t 1959 model is lower, being about one half that of the 1956 model at 120 km. At the present tim the maximum altitude at which density data from satellites has been obtained is just below 700 k For this reason, the tables end at 700 km. Dashed lines in the plots present a tentative extrapolati of the data to 1000 km. The value of the molecular weight, like other atmospheric properti probably depends on both location and time. The 1959 model curve probably represents the mol ular weight at high latitudes, such as Fort Churchill, where the experimental data were obtaine At lower latitudes the molecular weight may be nearer the curve given in the 1956 model. (*Sa item as* 11.8–178 and 11J–109, *Met. Abs.*) (For **ARDC Model Atmosphere, 1958,** *see*, 8.11–10, No 1957, *Met. Abs.*) *Subject Headings:* **1. Exosphere 2. ARDC Model Atmosphere.**—*Authors' abstra*

12D–37 551.510.535:551.524

Kallmann, H. Korf. (*University of California at L. A.*), **A new model of the atmosphere a ionosphere.** *Annales de Géophysique*, Paris, 14(2):140–143, April/June **1958.** 4 figs., 11 re **DLC**—A model giving the temperature distribution and electronic density with altitude up to 300 k is presented. The theoretical study of the ionosphere is still very complex since such a great numb of uncertainties in the various physical quantities are involved, such as photon emission from t solar atmosphere, air composition of the earth's atmosphere, true absorption and recombinati coefficients. (*Same item as* 10.4–159, April **1959,** *Met. Abs.*) *Subject Headings:* **1. Atmospher models 2. Ionosphere models 3. Solar atmosphere 4. Atmospheric composition.**—*A.V.*

12D–38 551.510.5:551.511.

U. S. Weather Bureau and U. S. Air Force. Geophysics Research Directorate. (Join Committee on Extension to the Standard Atmosphere. **U. S. extension to the ICAO standa atmosphere: tables and data to 300 standard geopotential kilometers.** Prepared under the directi of the Committee . . . by R. A. Minzner, W. S. Ripley and T. P. Condron. Wash., D. C., U. Govt. Print. Office, **1958.** 236 p. Almost entirely tables. **DWB** (M10.5 U587un). Review *Annales de Géophysique*, Paris, 12(4):296–298, Oct./Dec. **1956.** fig., table. *Monthly Weath Review*, Wash., D. C., 84(9):333–335, Sept. **1956.** fig., table. *American Meteorological Societ Bulletin*, 38(2):78–80, Feb. **1957.** fig., table.—A model of the earth's atmosphere to 300 kilomete altitude has been adopted in the United States as an extension of the ICAO Standard Atmospher Seventeen atmospheric properties plus the acceleration of gravity are discussed and the values f various altitudes are tabulated and presented graphically. Fourteen properties are rigorous related by kinetic theory. Of these fourteen, the altitude function of molecular-scale temperatu alone. The remaining properties require, in addition, the altitude dependence of molecular weig or the acceleration of gravity. The variation of three of the seventeen properties depends upo generally accepted empirical relationships. The defining functions of molecular-scale temperatu and molecular weight are consistent with rocket data. The tabulations and graphs are presented functions of both geopotential and geometric altitude in both metric and English units. *Subje Headings:* **1. ICAO standard atmosphere tables 2. Atmospheric models.**—*Authors' abstract.*

12D–39 551.510.5:551.511.

Arkhangel'skiĭ, V. N. and Sukhotskiĭ, E. I., **Novaia standartnaia atmosfera.** [A new standa atmosphere.] *Meteorologiia i Gidrologiia*, Leningrad, No. 5:55–58, **1958.** 3 figs., 2 tables. **DW**

DLC—The new expanded and more accurate standard atmosphere extending to a height of 300 km, developed in 1956 by the U. S. Weather Bureau and Geophysics Research Directorate of the Air Force, is described. Graphs are presented showing the variations of temperature with height (kinetic and molecular temperatures), the variation of pressure with height according to the new standard atmosphere and according to the tables of NACA 1947 for both day and night, variation of temperature with height for the NACA 1947 and for the new standard atmosphere values of temperature and pressure. The NACA and the new standard atmosphere are compared and the principal characteristics of the tables are described. It is also pointed out that up to a height of 25 km the standard atmosphere coincides with that of the U.S.S.R. (GOST 4402-48). In the 25 to 30 km interval the U. S. standard atmosphere accepts a temperature increase with a gradient of 3 degrees per kilometer while the GOST 4402-4X extends isothermy up to 30 km. Accordingly, at 30 km there are considerable differences in temperature, pressure and density values. (*Same item as* 11.9–239, Sept. 1960, *Met. Abs.*) *Subject Heading:* **1. Standard atmosphere.**—*I.L.D.*

12D–40 551.507.362.2:551.510.3:551.510.536:551.511.12

Sterne, Theodore E. (*Smithsonian Astrophysical and Harvard College Observatories*). **An atmospheric model, and some remarks on the inference of density, from the orbit of a close earth satellite.** *Astronomical Journal*, New Haven, Conn., 63(3):81–87, March **1958.** 4 tables, 4 refs., 12 eqs. **DLC**—The U. S. Air Force has extended the U. S. Standard Atmosphere to over 540,000 m of altitude. The author has extended the Air Force model to still greater heights, and suggests the employment of the resulting model for inferring the air density from observations of the orbit of a close earth satellite. Convenient equations, involving easy numerical quadratures in the eccentric anomaly, are derived accurately and fundamentally for the time-derivatives of the perigee and apogee distance of a close earth satellite moving through an atmosphere. If the extended Air Force atmospheric model is nearly correct, then a 50-centimeter, 10-kilogram, spherical earth satellite with a perigee height of about 200 mi and an apogee height of about 800 mi should be expected to have a life-time of about nine years. Calculations of only slide-rule accuracy enable rather accurate adjustments to be made to the density near perigee, from observations of the changing apogee distance. The density may not be determined from astronomical observations with much relative accuracy at heights much above the initial perigee. It is suggested that definitive adjustment of the atmospheric density be made by at least-squares solution in which the unknowns are the vertical gradients of the ratio of temperature to molecular weight in selected altitude zones. Equations are given for the differential changes in air density caused by differential changes in such gradients. (*Same item as* 10.10–157, and 11J–161, *Met. Abs.*) *Subject Headings:* **1. Standard atmosphere 2. Satellite density measurements 3. Upper atmosphere densities.**—*Author's abstract.*

12D–41 551.510.5:551.510.3:551.507.362.2

Sterne, T. E.; Folkart, B. M. and Schilling, G. F. (*all, Astrophysical Obs., Smithsonian Inst.*), **An interim model atmosphere fitted to preliminary densities inferred from U.S.S.R. satellites.** *Smithsonian Institution. Astrophysical Observatory, IGY Project No.* 30.10, *Special Report*, No. 7, Dec. 31, **1957.** 8 p. 3 figs., 7 refs., 8 eqs. **DWB.** Also issued in "edited form" as *Smithsonian Contributions to Astrophysics*, Wash., D. C., 2(10):275–279, **1958. DWB, DLC**—As earlier reported, preliminary values of the atmospheric density have been inferred from observations of artificial U.S.S.R. earth satellites. Those densities were greater than the densities predicted by most existing atmospheric models at corresponding altitudes. The present paper presents an interim and highly tentative atmospheric model adjusted to be the same as the ARDC Model Atmosphere, devised by Minzner and Ripley, at altitudes below about 90 km, and to agree with the densities inferred from the satellites at an altitude of 220 km (4.5×10^{-10} kg/M^3 or 8.7 times the density predicted by Minzner and Ripley). Although this model is crude and only roughly approximate, it may be of use in predicting the life-times of new earth satellites. (*Same item as* 9.11–159, and 11J–164, *Met. Abs.*) *Subject Headings:* **1. Atmospheric models 2. Air density calculations 3. Satellite observations.**—*Authors' abstract.*

12D–42 551.510.5:551.511.12

†Minzner, Raymond A. and Ripley, W. S., **The ARDC Model Atmosphere 1956.** *U. S. Air Force Cambridge Research Center, Air Force Surveys in Geophysics*, No. 86, Dec. **1956.** 201 p. numerous figs., tables, eqs., 53 refs. **DWB, DLC**—A large monograph presenting the extensive tabular data to 542, 686 m or 1,850,810 ft and the technical details of the calculations which entered into the solution of values for the ARDC Model Atmosphere of 1956. This Model Atmosphere is subject to revision each year, if necessary, but conforms with the ICAO Standard atmosphere in the region from 5 to 20 km. The details of 15 atmospheric properties are treated. Both metric and English units are given in tables. Different methods of computation are critically discussed. The basic elements are: 1) molecular-scale temperature, 2) pressure and 3) density. Secondary properties treated are 4) scale height, 5) speed of sound, 6) air particle speed and 7) specific weight, 8) molecular

weight, 9) molecular volume, 10) mean air density, 11) mean free path, 12) collision frequency, 13) real kinetic temperature, 14) coefficient of viscosity and 15) kinematic viscosity. This Model is to be used by all engineering and design work by or for ARDC. (*Same item as* 8.11–10, Nov. 1957, *Met. Abs.*) *Subject Headings:* **1. ARDC Model Atmosphere 2. ICAO Standard Atmosphere 3. Upper atmosphere properties. I. Sissenwine, N.**—*M.R.*

12D–43 551.510.5

Wexler, Harry (*U. S. W. B.*) and Sissenwine, Norman (*Geophs. Res. Direct. AFCRC*), **Announcement [of] extension to the standard atmosphere.** *Monthly Weather Review*, Wash., D. C., 84(9):333–335, Sept. **1956.** fig., table. **DWB, DLC.** Also in *American Meteorological Society, Bulletin*, 38(2):78–80, Feb. **1957** (*see item* 8.11–11, Nov. 1957, *Met. Abs.*). **DWB.** Also in *Journal of Atmospheric and Terrestrial Physics*, 10(3):181–183, March **1957.** fig., table. (*See item* 8.7–166, July 1957, *Met. Abs.*) **DWB**—A graph shows temperatures to 300 km according to new extension of ICAO standard atmosphere adopted by 23 U. S. scientific and engineering organizations (listed). From 0 to 32 km is called "Standard" from 32 to 75 km "Tentative Atmosphere" and from 75 to 300 km "Speculative Atmosphere" to indicate degree of reliability. Molecular-scale temperatures, real kinetic temperatures, lapse rates, molecular weights in grams/mole, and pressures in mb are given in a table for 11 standard levels from 11 to 300 km. (*Same item as* 10.1–185, Jan. 1959, *Met. Abs.*) *Subject Headings:* **1. Standard atmosphere to 300 km 2. ICAO Standard Atmosphere 3. Upper air temperatures.**—*M.R.*

12D–44 551.510.535

†*Kallmann, H. K., **A study of the structure of the ionosphere.** *Rand Corporation, Santa Monica, Calif.*, [*Papers*], P-638, Feb. **1955.** 164 p. 14 figs. (some fold.), 18 tables (some fold.), 162 refs., 53 eqs. Thesis (Ph.D.), Univ. of Calif. at L. A. (**1953?**). [Pub. in the *Physical Review*, April 1, **1953**]. **DWB**—An attempt at a realistic model of the upper atmosphere and ionosphere, based on the latest observational and theoretical results, especially with rockets, radio and acoustical soundings, meteor trail studies and auroral-airglow spectroscopy. Chapters include history, technique, physical properties up to 80, and from 80–220 km; the solar atmosphere, theory of ionization and recombination plus extensive numerical tables and diagrams giving coefficients, spectroscopic data, constants observational data and models of the various elements. (*Same item as* 10.1–28, Jan. 1959, *Met. Abs.*) *Subject Headings:* **1. Ionosphere models 2. Ionospheric data.**—*M.R.*

12D–45 551.510.5:551.511.12

Kellogg, William Welch, **Diagram of the structure of the upper atmosphere.** *Rand Corporation, Santa Monica, Calif.*, P-554, Aug. 1, **1954.** 2 p. diagr. (fold.). **DLC**—The accompanying diagram is designed to portray some of the physical features of the upper atmosphere. The ordinate is height (up to 400 km), and the distribution of some important parameters is plotted, accompanied by the levels at which various chemical and physical processes occur. It was prepared at the request of and in collaboration with ROBERT LIST, Scientific Services Div., U. S. Weather Bureau; it is expected that it will be included in a short section on meteorology in a forthcoming **Handbook of Physics**, being published under the sponsorship of the National Science Foundation. *Subject Headings:* **1. Atmospheric structure 2. Standard atmosphere 3. Atmospheric models.**—*Author's abstract.*

12D–46 551.510.5:551.511.12 551.524.7:539

Vassy, E., **Caractéristiques de l'atmosphère d'après des mesures directes.** [Characteristics of the atmosphere according to direct measurement.] *Journal Scientifique de la Météorologie*, Paris, 6(21):38–39, Jan./March **1954.** table. **DWB**—Data on pressure, temperature, density of air and mean free path, for each 2 km from 0 to 110 km, each 5 km to 160 km and each 10 km to 220 km, extracted from Havens, Koll and La Gow (*J. Geoph. Res.*, 57:59, **1952**) and Rocket Panel article (*Physical Rev.*, 88:1027, **1952**). Two estimates of temperature are given, one for constant M = 28.966 (g. mol.) and the other assuming O_2 dissociation above 80 km. The temperature calculated with a constant molecular structure is 11°C higher at 90 km, 23° at 100 km, 37° at 110 km, 87° at 130 km, 155° at 150 km, 273° at 180 km and 452° at 220 km than that assuming dissociation and variable M. Results are for lat. 32°N and long. 106°W. (*Same item as* 6E–173, May, 1955, *Met. Abs.*) *Subject Headings:* **1. Standard atmosphere to 220 km 2. Mean free path of N_2 3. Dissociation effects on stratospheric temperature.**—*M.R.*

12D–47 551.501.42 531.7.08

U. S. Office of Naval Research, **Physical constants and conversion factors.** 4th ed. Wash., D. C., Sept. **1953.** 1 p. (fold.). **DWB**—A large wall or desk chart giving numerous standard and conversion factors used in radiation and dynamic and synoptic calculations by meteorologists, but mainly in upper atmospheric research. The NACA standard atmosphere data (pressure and speed of sound) are given for 0 to 200,000 ft. (*Same item as* 6.5–40, May 1955, *Met. Abs.*) *Subject*

Headings: **1. Physical constants 2. Conversion tables 3. Standard atmosphere 4. NACA Standard Atmosphere.**—*M.R.*

12D–48 551.510.53:551.507.362.1(789)

Harvard College Observatory. Rocket Panel, **Pressures, densities, and temperatures in the upper atmospheres.** *Physical Review*, 88(5):1027–1032, Dec. 1, **1952.** 3 figs., 3 tables. **DWB**—Smoothed curves of pressure, density and temperature from 0 to 220 km from results of 68 V-2, 63 Aerobee and 7 Martin Viking rocket ascents at White Sands, N. Mexico. The panel does not consider this a standard atmosphere, but merely the combined results of numerous investigations as of Jan. 1952. Temperature calculations by many groups are tabulated and the weighted means and adopted values shown. Below 30 km values are obtained from radiosonde ascents at White Sands. No correlation has been made for dissociation of $O_2 > 80$ km, nor for seasonal effects, daylight effects or instrumental errors (the latter may be greater than real variations). Other soundings with rockets (on the equator) or by meteors and acoustical means in the Arctic (Fairbanks) and tropics are related to these data. The whole matter is still pending. (*Same item as* 5.3–121, and 11I–23, *Met. Abs.*) *Subject Headings:* **1. Upper atmosphere structure 2. Upper atmosphere models 3. Rocket data 4. White Sands, N. Mex.**—*M.R.*

12D–49 551.543.1:551.524.7

Jacchia, Luigi G. and Kopal, Zdeněk, **Atmospheric oscillations and the temperature profile of the upper atmosphere.** *Journal of Meteorology*, 9(1):13–23, Feb. **1952.** 4 figs., 9 tables, 17 refs., 26 eqs. **DWB**—The fundamental equations of resonance of solar atmospheric tides are set up and difficulties of application discussed. Numerical and mechanical integration was carried out for a number of temperature profiles up to 150 km. Neither the standard NACA nor the V2 profile gave large enough semidiurnal oscillations, but a satisfactory profile (N) was found giving suitable pressure oscillations of 12 and 10.8 hours (maxima 353°K at 50–52 km. and above 281° above 120 km., minima 216° at 14–24 km. and 197° at 82–84 km.) Surface oscillations are very sensitive to a change in the 50 km. maximum, less so in the 80 km. minimum and very little to changes above 90 km. (*Same item as* 3.9–149, Sept. 1952, *Met. Abs.*) *Subject Headings:* **1. Semidiurnal pressure variations 2. Temperature profiles 3. Upper atmosphere.**—*C.E.P.B.*

12D–50 551.510.535:551.510.41

*Nicolet, Marcel and Mange, P., **An introduction to the study of the physical constitution and chemical composition of the high atmosphere.** Pennsylvania, State College. Ionosphere Research Laboratory, Contract AF 19(122)-44, Ionospheric Research, Scientific Report, No. 35, April 15, **1952.** 115 p. 22 figs., 13 tables, 62 refs., eqs. **DWB**—Pressure, temperature, density, chemical data and the nature of the equilibrium in the upper atmosphere and the terms in use in discussing these factors are defined and treated in detail according to the latest models and information. Composition as determined from balloon and rocket samples, airglow, auroral and inospheric data, and as determined theoretically is given. The thermosphere and exosphere are also treated for the purpose of determining ionospheric behavior. A model with and one without molecular diffusion is presented for determining conditions above 160 km. (*Same item as* 6E–123, May 1955, *Met. Abs.*) *Subject Headings:* **1. Upper atmosphere physics 2. Chemical composition of upper atmosphere 3. Ionospheric models 4. Exosphere.**—*M.R.*

12D–51 551.596.1:551.510.535:551.524.7:551.557

Richardson, J. M. and Kennedy, W. B., **Atmospheric winds and temperatures to 50-kilometers altitude as determined by acoustical propagation studies.** *Acoustical Society of America, Journal*, 24(6):731–741, Nov. **1952.** 9 figs., 2 tables, 20 refs. **DLC**—Between July 1950 and May 1951, 500 charges of 200 lb each of TNT were fired thus obtaining an average of three sets of data per month sufficient for calculation of high altitude winds and temperatures over Wray (40°N, 102°W). Winds generally westerly and of large magnitude during winter and light easterly during summer with large fluctuations during equinoctial periods. Temperatures, wind speeds and azimuth at 5 km intervals to 50 km for each set of observations tabulated. (*Same item as* 4F–117, June 1953, *Met. Abs.*) *Subject Headings:* **1. Acoustical soundings 2. Ionospheric winds 3. Ionospheric research 4. Wray, Colorado.**—*G.J.E.*

12D–52 551.510.53 551.506.7

†*Stephens, Everett D., **The atmosphere: a review.** *U. S. Wright Air Development Center, Technical Note*, WCRR 52-16, Oct. **1952.** 25 p. charts (some fold.), table, 65 refs. **DWB**—A review of the data on the atmosphere, especially the upper atmosphere up to 120 km. The information summarized included the atmospheric models for describing atmospheric conditions above the F2 layer, an outline of method used for studying the atmosphere, the composition, the tem-

perature, pressure and distribution. The author concludes that the available data do not warrant a revision of the tentative reference atmosphere (NACA data) for use in comparative performance of flight propulsion systems. The various atmospheric properties are illustrated graphically. (*Same item as* 6.9–137, Sept. 1955, *Met. Abs.*) *Subject Headings:* **1. Upper air data 2. Upper atmosphere composition 3. NACA standard atmosphere.**—*I.L.D.*

12D–53 551.511:551.524.7:551.557:551.513

†Kellogg, William W. and Schilling, Gerhard F., **A proposed model of the circulation in the upper stratosphere.** *Journal of Meteorology*, 8(4):222–230, Aug. **1951.** 4 figs., 3 tables, 47 refs. **MH-BH**—Model is based on observation of wind (7 sources are listed), on temperature distribution (8 sources) and on 4 miscellaneous considerations (ozone distribution, total oscillation, dynamo theory and radiative equilibrium). In addition to elaborate schematic diagrams showing temperature between isobaric surfaces (0 –120 km) for all latitudes and a comparison between summer and winter temperature profile, a schematic representation of the circulation (wind direction, force and nature of flow) is given for the same cross section 90°N -90°S, and 0–120 km height. (*Same item as* 3.6–76, June 1952, *Met. Abs.*) *Subject Headings:* **1. General circulation 2. Stratospheric circulation 3. Temperature of the stratosphere 4. Upper air winds.**—*M.R.*

12D–54 551.510.53:551.524.7

Ley, Willy, **Die Grenze der Atmosphäre.** [Limits of the atmosphere.] *Beitrage zur Weltraumforschung und Weltraumfahrt*, Stuttgart, No. 3:4–8, Dec. **1949.** 2 tables. Mimeo. **DLC**—Brief historical review of knowledge on the height of the atmosphere. The latest available data for the vertical distribution of temperature, density, sound velocity and mean free path are given up to 300 km, based mainly on American research (U. S. NACA, Grimminger). (*Same item as* 6.4–115, April 1955, *Met. Abs.*) *Subject Headings:* **1. Height of atmosphere 2. Upper atmosphere research 3. Vertical temperature distribution.**—*A.A.*

12D–55 551.510.53:629.13

†Roberts, Howard E., **The earth's atmosphere.** *Aeronautical Engineering Review*, 8(10):18–31, Oct. **1949.** 16 figs., fold-in-chart, 41 refs. **DLC, DWB**—A systematic review of the latest knowledge and theories concerning the physical properties of the atmosphere, beginning with a discussion of the aerodynamic and thermodynamic theory, methods of observation and determination of characteristics and then taking up the various characteristics in detail: general structure, composition, temperature and pressure distribution, winds, cloud formations, electrical and acoustical phenomena, auroras, etc. Single diagrams illustrate the variations of each characteristic, and a beautiful fold-in chart integrates the entire field of knowledge of the atmosphere up to 1000 mi above sea level (pressure, temperature, speed of sound, wind, clouds, auroras, motions and man's accomplishments. There is an extensive bibliography on the subject. (*Same item as* 5–28, May 1950, *Met. Abs.*) *Subject Headings:* **1. Upper atmosphere 2. Atmospheric structure 3. Aeronautics.**—*M.R.*

12D–56 551.501.42:551.510.53 551.501.7

Warfield, Calvin N., **Tentative tables for the properties of the upper atmosphere.** *U. S. NACA. Technical Note*, No. 1200, **1947.** 50 p. 6 plates, biblio. p. 35–36. Summary p. 1–2. **DWB**—Considering all types of measurements made prior to 1947 a "tentative standard atmosphere" up to 120 k altitude has been constructed. "Most probable," "probable," "probable minimum," and "probable maximum" values are given. Table 1 gives a variety of properties of the atmosphere at sea level according to different standards. Tables 2 and 3 give absolute pressure and temperature, density, specific weight. coefficient of viscosity, kinematic viscosity, speed of sound, mean free path of molecules for heights of 20–120 km (mean, day, night). Tables 4 and 5 give for same heights the properties for tentative standard temperature based on an inverse square variation of gravity with latitude corrections. The plates show these data graphically. (*Same item as* J–98 and 2D–81, *Met. Abs.*) *Subject Heading:* **1. Standard atmosphere tables.**

COMPREHENSIVE ARTICLES

12D–57 551.510.53

Anido, Artiles, Agustin, **Estructura y funciones de la atmosfera.** [Structure and functions of the atmosphere.] *Cuadernos de Meteorologia*, Santa Clara, Cuba, 1(3):2–29, July **1957. DWB**—A review of current ideas on, the troposphere, tropopause and stratosphere-ozone layer-clouds in the stratosphere, luminous night clouds, ionosphere, influences of solar activity, influence of the moon, height of the atmosphere, composition of the atmosphere, routine explorations, recent investigations on the structure and property of the atmosphere, and terminology. *Subject Heading:* **1. Atmospheric structure.**—*E.S.*

12D–58 551.510.41:551.510.53

*†Bates, D. R., **The earth's atmosphere.** *Royal Astronomical Society, Monthly Notices*, 109(2): 215–245, **1949.** 7 tables, 40 formulas, numerous refs. **DLC**—A systematic account of the subject summarizing the data about the constitution, the density and the temperature up to 300 km at various levels of the atmosphere. Temperatures and particle concentrations below the 120 km level and properties of the atmosphere in the region of F_1 and F_2 layers are presented. Fractional volume concentration of each constituent at ground level is given in a table, showing 0.003 for carbon dioxide. (*Same item as* 3B–197, Feb. 1952, *Met. Abs.*) *Subject Headings:* **1. Carbon dioxide 2. Upper atmosphere densities 3. Upper air temperatures.**—*E.K.*

12D–59 551.510.41:551.507.362.1

Bates, D. R. (*Queen's Univ. of Belfast*), **Composition and structure of the atmosphere.** (In: Bates, D. R. (*ed.*), **The earth and its atmosphere,** N. Y., Basic Books, 1957, p. 97–112. 2 figs., 2 tables.) **DLC**—The earth's atmosphere, its composition-and structure, the inert gases, CO_2 and minor constituents; pressure, density and temperature aloft as determined from rockets; composition and diffusive separation; heat balance, the nitrogen cycle, etc., are discussed and illustrated by a few schematic diagrams. (*Same item as* 9.11–147, and 11I–91, *Met. Abs.*) *Subject Headings:* **1. Atmospheric structure 2. Atmospheric composition 3. Rocket observations.**—*M.R.*

12D–60 551.506.7:551.507.362.1

Blamont, Jaques, **L'exploration de la haute atmosphère au moyen de fusées.** [Exploration of the upper atmosphere by means of rockets.] *L'Astronomie*, Paris, 74(4):145–156, April **1960.** 15 figs. **DLC, NNC, DWB**—Very inclusive synthesis of the most recent research and discoveries concerned with the structure of the upper atmosphere. The techniques used to measure the various elements and phenomena at high altitudes (radioelectric propagation, temperature, pressure, density, nocturnal sky, polar auroras, nacreous clouds, etc.) are described. A drawing presents a method which measures the stagnation pressure on the nose of the rocket and the actual pressure on the shell by means of membranes at the same time. Density is measured either by dropping a sphere of which the trajectory is tracked by radar, or with the help of satellites which at their perigee are braked down by friction, this involving a precession of their trajectory. Temperature is measured from the speed of sound propagation in the atmosphere; it depends only on temperature and atomicity. A warm layer exists between 30 and 60 kms and is probably due to the absorption of the solar energy through ozone. The air composition is determined by means of bottles which are automatically opened and closed in view of taking up air samples to be analyzed in laboratory. A figure shows the arrangement of a sampling device on aerobee rockets. Other figures indicate the variations of density, temperature and separation through diffusion as obtained from rockets and satellites. Considerations are emitted concerning the ionizing action of solar radiations, the formation of the D and E regions, the electron density and the Van Allen Belts. The ejection of various materials (sodium) in the upper atmosphere has permitted the measurement of the wind speeds and has put into evidence the turbulence which exists up to 100 kms. The U. S. Argus experiment, consisting in the explosion of 3 atom bombs at 450 kms altitude, has formed a layer of electrons trapped by the magnetic field between the two Van Allen layers. The results of this experiment are briefly commented on. *Subject Headings:* **1. Rocket measurements 2. Upper atmosphere research.**—*A.V.* Ⓢ

12D–61 523.035/6 523.031

Bohm, K. H. and Richter, E. (*both, Inst. für Theoretische Physik, Univ. Kiel*), **Konvektion in einer Atmosphäre mit tiefenabhängigem Temperaturgradienten und starker Dichtevariation.** [Convection in an atmosphere with a depth-dependent temperature gradient and strong density variations.] *Zeitschrift für Astrophysik*, Berlin, 50(2):79–95, **1960.** 8 figs., 3 tables, 11 refs., 30 eqs. English summary p. 79. **DLC**—The thermal convection in three-layer model atmospheres of the following kind is investigated: A convective zone consists of a narrow layer with a large excess of the actual temperature gradient over the adiabatic one, superposed on a deep layer with a much smaller excess temperature gradient. On the top of the whole convection zone there is a stable zone of small thickness. A large density variation between the top and the bottom of the convection zone is taken into account. The relation between the horizontal wave number of a disturbance and the degree of instability has been derived for four different models of this type and leads to the following conclusions: 1) the rapid increase of the degree of instability with increasing wave number as found by Skumanich (1955) depends critically on the assumption that the unstable zone extends exactly up to the surface of the star. Even if the convection zone is superposed only by a narrow stable layer the increase of instability with wave number is much slower. 2) Modes of convection with vertical mass flow confined essentially to the narrow layer of high excess temperature gradient increase much more rapidly with time than modes with a large exchange of matter between both parts of the convection zone. 3) For a model with constant polytropic exponent within the unstable zone, convection modes of large horizontal wave number also show a larger flow of mass in the upper

regions of the zone than in the lower part, but the effect is much less pronounced than in the case of a two-layer model of the unstable zone. The assumption of the characteristic scale of the mass flow being proportional to the scale height (for pressure, the density or the temperature) leads to inconsistencies. (*Same item as* 11.12-8, Dec. 1960, *Met. Abs.*) *Subject Headings:* **1. Thermal convection 2. Temperature gradient 3. Density gradients 4. Large scale exchange 5. Stellar atmospheres.**—*Authors' abstract.* Ⓢ

12D-62 551.507.362.1:551.501.7

Boyd, R. L. F., **Rocket research in the upper atmosphere.** *Science Progress*, 42(167):435 448, July **1954.** 4 refs. **DLC**—Brief descriptions are given of methods of investigating upper atmosphere, rocket research, problems of instrumentation, recovery of observed data and determination of rocket coordinates. Methods are summarized of measuring, up to about 100 km or more, the air pressure, density, temperature, winds and ozone concentration, and of obtaining air samples. Other observations include ion and electron density, magnetic fields, airglow, solar spectra, meteors and cosmic rays. (*Same item as* 5.10-49, May 1954, *Met. Abs.*) *Subject Heading:* **1. Rocket research.**—*C.E P.B.*

12D-63 551.510.5:001.4

Demianczuk, Piotr P., **Współczesny pogląd na budowe atmosfery ziemskiej.** [Contemporary view of the structure of the earth's atmosphere.] *Gazeta Obserwatora PIHM*, Warsaw, 7(9):2-6, Sept. **1954.** fig., 5 tables. **DLC.** Transl. into English available **DWB** (M10 D378co)—The terminology proposed for the atmospheric structure to >1000 km by G. W. Wares (1953) and by Tverskoĭ (1952) are compared. The former has 6 spheres, the latter 4, with subdivisions of each. The troposphere and its 3 layers, the stratosphere and its 3 layers, the ionospheric layers and the sphere of dissipation (or exosphere) are discussed separately in some detail with regard to structure and composition. *Subject Headings:* **1. Atmospheric structure 2. Atmospheric nomenclature.** —*M.R.*

12D-64 551.510.5

Gerson, N. C., **The terrestrial atmosphere.** *Science Progress*, London, 40(158):245-254, April **1952.** fig., 7 tables, **DWB**—The atmosphere is divided into troposphere, stratosphere, chemosphere, mesosphere and exosphere by surfaces (in lat. 45°) at 11, 32, 80 and 400 km. Text and tables summarize composition and photochemistry, temperature, pressure, density and free path at different levels, height and electron density of ionic layers D-G. Brief accounts are given of aurora, night and twilight airglow, and dynamics of ionosphere and mesosphere. (*Same item as* 3.7-77, July 1952, *Met. Abs.*) *Subject Headings:* **1. Light of the night sky 2. Atmospheric structure 3. Auroras 4. Ionosphere.**—*C.E.P.B.*

12D-65 551.510.53

*†Gerson, N. C. (*U. S. Air Force, Cambridge Res. Center*), **Unsolved problems in physics of the high atmosphere.** *Advances in Geophysics*, New York, 1:155-242, **1952.** 12 figs., 10 tables, 177 refs. **DLC**—The various subdivisions of the atmosphere (troposphere, stratosphere, chemosphere, ionosphere, mesosphere and exosphere) are defined and discussed. Chemical composition of the atmosphere is discussed and given in tables of the normal chemical constituents, the isotopes, ionization and dissociation potentials of molecules, and probable constituents of ionosphere and chemosphere, and origin thereof. Also tabulated are temperature, pressure number, density, mean free path and kinematic viscosity at altitudes from 0-800 km in mid-latitudes and two seasons. The ionosphere, emissions (air flow and aurora) and spectra thereof, new techniques for estimating ionospheric winds from cloud (noctilucent, luminous, airglow and sporadic E clouds) movements. States properties and processes such as temperature and its determination by various means, composition as determined from emission spectra and absorption spectra, photochemical equilibrium, collisional phenomena, ionospheric tides and other oscillations, diffusion in magnetic and electric fields and, finally, a summary of unsolved problems which are being or should be worked on. A very extensive bibliography (177 items) on all aspects of high atmospheric physics, is appended. (*Same item as* 4.8-10, Aug. 1953, *Met. Abs.*) *Subject Headings:* **1. Upper atmosphere research 2. Atmospheric structure 3. Atmospheric composition 4. Review articles 5. Advances in Geophysics.**—*M.R.*

12D-66 551.507.362.2:551.510.3:551.510.536

Grimminger, George (*U. S. Air Force, Wash., D. C.*). **Density of the upper atmosphere.** *Nature*, London, 183(4664):811-812, March 21, **1959.** 3 refs. **DWB**—This is an interesting comparison between tabulated data theoretically arrived at by the author before any artificial satellites or rockets were used (*see* 8-31, Aug. 1950, *Met. Abs*) and data obtained by means of satellites. It shows that there is more agreement than not depending on the values of latitudes. (*Same item as* 11J-59, Oct. 1960, *Met. Abs.*) *Subject Headings:* **1. Satellite density measurements 2. Upper atmosphere densities.**—*W.N.* Ⓢ

12D–67 551.510:551.507.362.1(789)

Havens, R. J., Koll, R. T. and LaGow, H. E. (*U. S. Naval Res. Lab., Wash., D. C.*), **The pressure, density, and temperature of the earth's atmosphere to 160 kilometers.** *Journal of Geophysical Research*, 57(1):59–72, March **1952.** 7 figs., 4 tables, 13 refs. Also [table extracted from this article]: **Druck, Dichte und Temperatur der Erdatmosphäre bis zu 160 km Höhe.** [Pressure, density and temperature of the earth's atmosphere up to 160 km altitude.] *Sternenwelt, Munich*, 4(9/10):186, **1952. DLC**—A program of pressure measurements with rockets over White Sands, N. Mex., and over the equator has given values for atmospheric pressure, density and temperature from the ground up to 160 km above sea level. The data have been obtained from about a dozen rocket flights at White Sands, N. Mex., lat. 32°N, long. 106°W, and from one flight at the equator, long. 160°W. Measurements were made in every month except April, June and July. One rocket flown at midnight, while the others were between 09^h00^m and 19^h00^m local time. Except for one daytime flight at White Sands, all the pressure data agree within the experimental errors. The fundamental data are pressures measured on the nose tips, nose cones, and tail section of V-2, Viking, and Aerobee rockets. From these measurements, atmospheric pressures, densities, and temperatures have been deduced. The pressure at 160 km is 2×10^{-6} mm Hg, and the density is 1.5×10^{-6} gm/m³. The temperature reaches a maximum of 270°K at 50 km, a minimum of 190°K at 80 km, and increases to about 500°K at 160 km. (*Same item as* 4.1–75, 5.2–31, 5.9–92, 11I–24, *Met. Abs.*) *Subject Headings:* **1. Atmospheric structure 2. Stratospheric structure 3. Rocket soundings 4. White Sands, N. Mex.**—*Authors' abstract.*

12D–68 551.510.53

*†Hulburt, E. O. (*Naval Research Laboratory, Wash., D. C.*), **Physics of the upper atmosphere.** *Meteorological Monographs* (American Meteorological Society), Boston, 3(12–20):160–181, July **1957.** 20 figs., 9 tables, bibliog. p. 180–181. 18 eqs. **DWB, DLC**—A report on the progress in our knowledge of the upper atmosphere that has taken place during the interval 1951–1955. The status of our knowledge in this field as summarized in the **Compendium of Meteorology** is reviewed briefly. This is followed by a detailed account, accompanied by numerical data (presented in graph and tables), by equations and diagrams of the following subjects: pressure, density and temperature of the upper atmosphere, mass spectrographic and positive ion spectrographic measurements with rockets, spectrum of the sun outside the atmosphere, vertical distribution of atmospheric ozone, upper atmospheric temperature changes due to ozone, dissociation of oxygen in the upper atmosphere, the ionosphere, the D region ionization, normal and sporadic D region ionization, theory of E and F2 regions, temperature and density of the ionosphere under control of thermal conductivity, variations of the ionosphere and of the solar intensity with sunspots, the aurora, and magnetic self-focused solar ion streams as the cause of auroras. (*Same item as* 12.1–291, Jan. 1961, *Met. Abs.*) *Subject Headings:* **1. Upper atmosphere physics 2. Rocket spectrograph observations 3. Ionospheric ionization 4. Auroras.**—*I.L.D.*

12D–69 551.510.5:551.524.7

Isimaru, Yukiti, **The mechanism of the earth's atmosphere. First and second communications.** *Geophysical Magazine, Tokyo*, 21(4):269–301, 303–342, Aug. **1950.** 15 figs., 29 tables, 81 refs., 230 eqs. **MH-BH**—The earth's atmosphere is regarded as an ellipsoid balancing gravity against centrifugal force. The heat balance is determined by temperature difference equator-pole; mean lapse rate is represented by this/height of tropopause, giving a calculated value of 0.55°/100 m. Relation between height and temperature of tropopause is discussed; tropopause is an oblate ellipsoid of eccentricity 1/579. Seasonal variation and annual mean temperature at earth's surface are discussed mathematically, including effect of land and sea distribution and ocean currents. In Pt. II author regards surface as a sphere; apparent center of gravity 128 km. from geometric center. He calculates shape and temperature distribution of troposphere, ozonosphere and ozonopause (about 50 km.) and ionosphere. Results are in good agreement with those obtained by other methods up to 150 km. and he extends his calculations to 300 km. for latitude 0–90°. The whole paper is a remarkable *tour de force.* (*Same item as* 2.10–53, Oct. 1951, *Met. Abs.*) *Subject Headings:* **1. Mechanics of the atmosphere 2. Atmospheric structure 3. Vertical temperature distribution.** —*C.E.P.B.*

12D–70 551.510.5:551.524.7

Kitaoka, T. and Nakamura, S. (*both, Japan Met. Agency, Tokyo*), **Some considerations on the standard atmosphere.** *Geophysical Magazine*, Tokyo, 28(4):421–430, Sept. **1958.** 8 figs., table 5 refs., eqs. A shorter version with similar title in *Journal of Meteorological Research*, Tokyo, 10(1):73–78, **1958.** 8 figs., table, 5 refs. In Japanese. **DWB, DLC**—In connection with the problem of standard atmosphere, some statistical investigations on the lapse rate of temperature and the mean state of atmosphere are made over the world. It is pointed out that the lapse rate of temperature is smaller at the end of continent than at its west end and the mean state of atmosphere

is classified into three groups, the higher latitudes than 60°, the lower latitudes than 30° and the intervening latitudes. *Subject Headings:* **1. Standard atmosphere 2. Vertical temperature gradient 3. Lapse rate variations.**—*Authors' abstract and J. Woo.*

12D–71 551.510.53:551.506.7:551.593.55

Kondrat'ev, K. Ia., **K voprosu o termicheskom zondirovanii atmosfery po dannym fotometrirovaniia sumerek.** [Problem of thermal sounding of atmosphere with the photometric data of twilight.] *Leningrad. Universitet, Vestnik*, No. 10 (No. 2 of its Seriia Fiziki i Khimii), **1960.** p. 45–48. 2 figs., 8 refs. **DWB** (M24.2 K82kv), **DLC** (AS262.L463)—The "twilight" method of study of the atmospheric structure is briefly described with review of published work of N. M. Shtaude, T. G. Megrelishvili and others. This method is related to the optical characteristics of upper atmosphere and based on multiple scattering of light measured by the photoelectronic counter FEU-22 with sensitivity to wavelength of 300–1100 (mμ). Computed vertical temperature distribution up to 250 km is plotted against the altitude with data of other investigators and standard temperature distribution. In view of scattered data the results were re-plotted in reference to the derivatives of logarithm of the sky brightness (I) at Zenith $[(1/I)(dI/dt)]$. The analysis of the results indicate that the "twilight" method in general form gives only average values of the temperature. Better results were obtained with photometry of the twilight near the infrared region of the spectrum and also in such sky portions which have minimum effect of multiple and aerosol scattering. *Subject Headings:* **1. Vertical temperature distribution 2. Twilight spectra.**—*N.P.S.* Ⓢ

12D–72 551.510.3:551.510.53(712.7)

LaGow, H. E.; Horowitz, R. and Ainsworth, J. (*all, U. S. Naval Res.Lab., Wash., D.C.*), **Results of IGY atmospheric density measurements above Fort Churchill.** International Space Science Symposium, Nice, Jan. 1960, **Space Research: proceedings of the First Symposium.** Pub. **1960.** p. 164–174. 9 figs., table, 13 refs. Russian summary p. 164. **DWB** (523.1 161sp)—Atmospheric density, pressure, and scale height data have been obtained with Aerobee-Hi rockets fired at Fort Churchill as part of the U. S.-I. G. Y. program. Data were obtained from all four rocket flights. Although some of the results are awaiting final examination, it appears that at 59°N latitude: (1) the summer densities from 30 to 70 kilometers are approximately 5 to 10% higher than the Rocket Panel values for 33°N, (2) the winter densities from 25 to 85 kilometers are 10 to 40% lower than the corresponding summer values; thus they are 5 to 30% lower than the 33°N Rocket Panel values, (3) the day-time atmospheric density value at 200 kilometers is higher both in summer and fall than the summer value of 1.4×10^{-7} g/m³ at 33°N obtained in August 1951, (4) the 188 kilometer fall-day density value of 5.2×10^{-7} g/m³ is approximately 40% lower than the corresponding summer day value, (5) the fall-day density profile obtained in 1958 is in good agreement with the single fall-day density value obtained at peak of flight in 1956, (6) the fall-day and summer-day atmospheric pressure in the 110 km region are the same to within the measuring accuracy, and are a factor of about 2.5 higher than the corresponding 33°N value. *Subject Headings:* **1. Upper atmosphere density measurements 2. IGY data 3. Fort Churchill, Canada.**—*Authors' abstract.* Ⓢ

12D–73 551.521.11:551.510.53

Lönnqvist, Olov, **The annual duration of sunshine in the upper atmosphere.** *Annalen der Meteorologie*, 5(7/12):202–206, **1952.** 5 figs., 5 refs. English and German summaries p. 202. **MH-BH**—Duration of sunshine is shown in graphs for 0–1000 km, 90°N–90°S for March, April, May and June, and year. Above 575 km poles have permanent sunshine. Energy per unit area at various levels and latitudes is plotted and compared with temperature and wind profiles. The possibility that the excess of solar radiation in high latitudes causes the observed excess of mean temperature above the tropopause is discussed. (*Same item as* 5.5–120, May 1954, *Met. Abs.*) *Subject Heading:* **1. Sunshine in the stratosphere.**—*C.E.P.B.*

12D–74 551.510.53

†Mitra, S. K. (*Univ. of Calcutta*), **General aspects of upper atmospheric physics.** (In: **Compendium of meteorology.** Boston, American Meteorological Society, **1951.** p. 245–261. 7 figs., 3 tables, 108 refs.) **DWB**—Effect of radiation and turbulence on structure of the atmosphere is first considered. Then the outer limit of the atmosphere, the escape of gases (cone of escape), problem of deficiency of helium in atmosphere, the exosphere or fringe region (similar to corona of sun), the solar control of upper atmosphere, effect of solar UV radiation on various atmospheric gases, geometry of illumination of upper atmosphere by sun, etc. accompanied by models and tables, are discussed. Methods of investigation or exploration are next considered. Direct methods (balloon, smoke shell, V-2 rocket, sound and radio), and indirect (meteors, auroras, night sky light, magnetic variations, barometric oscillation, noctilucent clouds and scattering of UV light) are considered systematically. (*Same item as* 4.5–10, May 1953, *Met. Abs.*) *Subject Headings:* **1. Upper atmospheric physics 2. Outer atmosphere investigations 3. Exosphere.**—*M.R.*

12D–75 551.510.53

†Mitra, Sisir Kumar (*Univ. of Calcutta, India*), **General aspects of upper atmospheric physics.** *U. S. Air Force. Cambridge Research Center, Geophysical Research Papers*, No. 11:19–54, **1952.** 6 figs., 3 tables, 22 refs. **DWB**—As an introductory speech for the Conference on Ionospheric Physics, PROF. MITRA outlined in detail our knowledge of the upper atmosphere in all of its ramifications, and presented a number of problems for future study. The escape of gases in the fringe region, illumination, meteor trails, auroras, radio wave soundings, solar and cosmic radiation effects, ionization, luminescence, winds, effect on weather conditions in the troposphere (and vice versa), extent of the atmosphere, normal state of pressure and temperature, etc. are discussed and many aspects illustrated. (*Same item as* 4.6–79, June 1953, *Met Abs.*) *Subject Headings:* **1. Ionospheric physics 2. Ionospheric research.**—*M.R.*

12D–76 551.507.362.1:551.510.53

†Newell, Homer E., Jr., **The upper atmosphere studied by rockets and satellites.** (In: Ratcliffe, J. A. (*ed.*), **Physics of the upper atmosphere.** N. Y., Academic Press, **1960.** p. 73–132. 26 figs., 12 tables, 99 refs., eqs.) **DWB** (M10.5 R2333ph)—It is over a decade now that the rocket technique has been in use for the research of the upper atmosphere and the sun, particularly in the U. S. and the Soviet Union. Measurements have been made from the ground out to several hundred kilometers. This chapter is devoted to a discussion of rocket sounding of the upper atmosphere, and to a description of major results obtained on: atmospheric temperatures, pressures, densities, winds and composition; the ionosphere and the earth's magnetic field; auroral particles; airglow; and meteors. The text is accompanied by numerous graphs and tables. *Subject Headings:* **1. Rocket exploration of the upper atmosphere 2. Rocket soundings 3. Upper atmosphere structure.**—*I.S.* Ⓢ

12D–77 551.510.53:551.510.41

*†Nicolet, Marcel, **The properties and constitution of the upper atmosphere.** (In: Ratcliffe, J. A. (*ed.*), **Physics of the upper atmosphere.** N. Y., Academic Press, **1960.** p. 17–71. 15 figs., 7 tables, 60 refs., numerous eqs.) **DWB** (M10.5 R233ph)—Different atmospheric regions are described and graphically illustrated. Next interrelation between pressure, temperature and composition is theoretically explained. Then major and minor constituents of the homosphere are described and tabulated. This is followed by a discussion of the dissociation of molecular oxygen. Since ionospheric data, rocket results and satellite observations have shown that the temperature gradient is very large in the thermosphere, in the next section thermal conductivity in that part of the atmosphere is explained. The final section is devoted to a consideration of the constitution of the upper atmosphere. The text is extensively illustrated by graphs and tables. *Subject Headings:* **1. Upper air pressures 2. Upper air temperatures 3. Upper atmosphere composition.**—*I.S.* Ⓢ

12D–78 551.524.7:551.547 551.510.53(789)

Penndorf, Rudolf, **Die vertikale Druck-und Temperaturverteilung bis 120 km. Höhe über Neu Mexico (USA).** [The vertical pressure and temperature distribution up to 120 km height over New Mexico (U. S. A.).] *Annalen der Meteorologie*, 2(3–4):91–95, March-April **1949.** 3 figs., 8 refs., 2 eqs. German and English summaries p. 91. **Pt. 2.** *Ibid.*, 3(7–8):241–243, **1950.** 2 figs., table, 6 refs. German and English summaries p. 241. **DWB**—Pt. 1. V-2 ascents at White Sands measured pressure by aneroid to 10 mb, and vacuum meters to 10^{-6} mb. Temperature was measured by dp/dh. Temperature gave minima of ca. 210°K at 20 km and 180–220°K about 80 km, and a maximum of 275–320°K at 50–60 km. The absolute values above 100 km were found uncertain, assumed in the E layer (110–120 km) might reach 300°K. Pt. 2. New pressure measurements at 160 km showed 10^{-6} mm Hg. At 50 km temperatures were: summer, Alaska +19°C, Bermuda, −20°C; winter, Alaska, −45°C. A table is given of winds 20–60 km in Panama, Bermuda and Alaska. (*Same item as* 2–114 and 2.2–47, *Met. Abs.*) *Subject Headings:* **Upper air temperatures 2. Upper air pressure 3. New Mexico.**—*E.K.*

12D–79 551.506.22:551.557.5:629.13 551.510.53

Pinus, N. Z., **Mezhdunarodnyĭ geofizicheskiĭ god i problemy aviatsii.** [IGY and aviation problems.] *U.S.S.R. Glavnoe Upravlenie Gidrometeorologicheskoĭ Sluzhby. Komitet po Provedeniiu Mezhdunarodnogo Geofizicheskogo Goda, Informatsionnyĭ Sbornik*, No. 4:44–56, **1957.** 8 figs., 3 tables, 10 refs. **DWB**—Of special importance to aviation is the wind regime at high altitudes, consequently during the IGY special studies will be made of the jet stream. The characteristics of the jet stream, namely the wind velocities, its seasonal behavior and its properties in the temperate, subtropical and tropical latitudes, etc. are discussed with the aid of charts giving a vertical cross section of the atmosphere (Aug. 15, 1943) from Norway to northwest Spain during a jet stream flow; examples of the position of the jet stream in the Northern Hemisphere, horizontal projection of trajectories of balloons released in Japan in January-February 1956, and winter wind velocities at 10 km in the Northern Hemisphere. Present knowledge on the dissociation of oxygen and nitrogen

at elevations above 90 km and on the concentration of ozone with elevation in the atmosphere a indicated by rocket studies is summarized. Also existing information on the distribution of atmos pheric temperature and density with elevation, and the characteristics of standard atmospheres ar discussed. Graphs giving the temperature distribution at various altitudes up to 500 km and c relative density up to 800 km, and a table of the U. S. Standard Atmosphere, are presented. (*Sam item as* 111–111, Sept. 1960, *Met. Abs.*) *Subject Headings:* **1. IGY upper atmosphere program 2. Je stream studies 3. Upper atmosphere research.**—*I.L.D.*

12D–80 551.507.362.1:551.510.53:061.

Shvidkovskiĭ, E. G., **Raketnye issledovaniia vysokikh sloev atmosfery.** [Rocket investigation of the upper layers of the atmosphere.] *Moscow. Tsentral'naia Aerologicheskaia Observatoriia* Trudy, No. 26:65–73, **1959.** 4 figs., 3 tables, 3 refs. **DLC**—Scientific information concernin physical, electric and magnetic characteristics of the upper layers of the atmosphere is reviewed Among these characteristics are: interaction of electro-magnetic and corpuscular radiation of su with the atmosphere; mass and energy spectrum of the primary cosmic radiation; solar radiatio emission, structure and property of upper atmospheric layers and their effects on the lower atmos phere; air currents and turbulence, etc. At the present time many of these characteristics can b observed with rockets and satellites. The present discussion is limited only to the analysis of tabu lated data on the physical properties of the atmosphere:—relative composition (O_2 N_2 and A) o atmosphere at various altitudes, temperatures, pressures and densities in comparison with publishe American data on the same property at the same altitude. The diagramatic arrangement of instru ments of the meteorological rocket head and their basic characteristics are described and illustrated *Subject Headings:* **1. Upper atmosphere properties 2. Rocket observation techniques.**—*N.P.S.* Ⓢ

12D–81 551.510.53:551.55

†Weekes, K., **The physical state of the upper atmosphere.** *Royal Meteorological Society, Quarterl Journal,* 80(343):2–15, Jan. **1954.** 2 tables, 46 refs. **DWB**—Upper atmosphere is defined as 5% lying above 20 km. Composition is nearly uniform up to at least 60 km and appreciable diffusiv separation is unlikely below 100 km. Absorption of UV radiation leads to formation of O_3 in 20–5 km and atomic O in 90–140 km. Dissociation of N_2 and H_2O is discussed. Temperature an pressure distribution inferred in 1947 is compared with results of rocket experiments; a table o density, particle density and temperature up to 160 km shows minimum temperature (200°K) a 80 km and maximum (468°K) at 160 km. Absence of seasonal or diurnal variation indicates efficien cooling. Theory of winds and movements is discussed. Measurements show winds of about 100 m and a rather turbulent atmosphere in 80–120 km. Movements of ionization show drifts mostl 20–150 m/s with a large semidiurnal component and magnetic disturbance effect in E and F layer but caution is necessary in interpreting results. (*Same item as* 5.7–74, July 1954, *Met. Abs.*) *Subjec Headings:* **1. Upper atmosphere research 2. Stratospheric winds.**—*C.E.P.B.*

12D–82 551.506.7:551.507.362.

Whipple, Fred L. (*Harvard Col. Obs.*), **Density, pressure and temperature data above 30 kilo meters.** (In: Kuiper, Gerard P. (*ed.*), **The earth as a planet.** Chicago. Univ. of Chicago Press **1954.** p. 491–513. 7 figs., 3 tables, 19 refs.) **DLC** (QB501. K75)—A complete summary of result of recent observations of upper atmosphere pressure, density and temperature, as obtained fro rocket firings. Earlier work is not reviewed. Diurnal, seasonal and latitudinal variations ar discussed, and the chief results tabulated by 2, 5 or 10 km levels up to 219 km, and shown on graph (to 160 km). Meteor and sound propagation data are also considered briefly. (*Same item as* 9.2–153 *and* 111–54, *Met. Abs.*) *Subject Headings:* **1. Upper air data 2. Rocket observation data.**—*M.R.*

ATMOSPHERIC STRUCTURE 30 TO 80 KM.

1907

12D–83 551.511.33:551.51

Knoche, Walter, **Zum Wärmegehalt der Atmosphäre.** [Heat content of the atmosphere. *Beiträge zur Physik der Freien Atmosphäre,* Strassburg, 2(4):177–182, **1907.** 4 figs., 4 tables **DLC**—In an article on the heat balance of the earth, the author presents a model of the atmospher from 0 to 50 km in tabular and graphic form, including theoretical-empirical curves of vertica distribution of heat content Q in kg. cal./cu m., equivalent temperature, and temperature. The hea content curve reaches a minimum at ca. 10 km and rises to 30 km then becoming constant up t 50 km. However, the temperature and equivalent temperature curves go on falling to a value o −19.4°C at 50 km—evidently completely ignoring the tropopause and data on the stratospher accumulated for 5 years or more. Pressure and vapor pressure are also given in table. (*Same iten*

as 5D–10, April 1954, *Met. Abs.*) *Subject Headings:* **1. Atmospheric models 2. Heat balance of atmosphere 3. Tropopause theories.**—*M.R.*

1923–1926

12D–84 551.524.7:523.52

Lindemann, F. A. and Dobson, G. M. B., **A theory of meteors, and the density and temperature of the outer atmosphere to which it leads.** *Royal Society of London, Proceedings, A*, 102:411–437, **1923.** 6 figs., 4 equations. **DLC**—Found that temperatures do not decrease linearly with distance from earth. Sixty km temperatures are essentially the same as earth level temperature and some 60°K hotter than region about 15 km. A tentative explanation is given to account for high temperatures based on the radiative properties of ozone. Formulas are derived, and from observed meteoric data the density or temperature of the air at great heights is calculated in four independent ways, which give results consistent with one another. (*Same item as* J–15, Oct. 1950, *Met. Abs.*) *Subject Headings:* **1. Upper air temperatures 2. Meteors 3. Temperature of stratosphere.**

12D–85 551.524.7:551.596.1

Whipple, F. J. W., **The high temperature of the upper atmosphere as an explanation of zones of audibility.** *Nature*, London, 111:187, **1923.** 3 refs. **DLC**—Author proposes that increased temperature at 60 km altitude in the stratosphere, as discovered by Lindemann and Dobson (see item J–15), might well explain zones of silence and of abnormal audibility. (*Same item as* J–16, Oct. 1950, *Met. Abs.*) *Subject Headings:* **1. Upper air temperatures 2. Anomalous sound propagation 3. Audibility zones.**

12D–86 551.596.1:551.524.7

†Gutenberg, B., **Die Entstehung der anormalen Schallzonen bei Explosionen.** [The formation of abnormal zones of sound from explosions.] *Zeitschrift für Geophysik*, 2:260–266, **1926.** 2 figs., table, 21 refs., equations. **DLC**—Discussion of the Lindemann-Dobson discovery of warm temperatures above 35 km. considering particularly implications with regards to anomalous propagation of sound. (*Same item as* J–25, Oct. 1950, *Met. Abs.*) *Subject Headings:* **1. Anomalous sound propagation 2. Upper air temperatures.**

1928–1939

12D–87 551.510.534:546.214

*Duckert, Paul, **Messungen des Ozongehaltes über Lindenberg.** [Measurements of ozone content over Lindenberg.] *Beiträge zur Physik der freien Atmosphäre*, 4(4):219–239, **1928.** 12 figs., 4 tables, refs., eqs. **DLC**—A scatter diagram shows a strong negative correlation between the height of the tropopause and the thickness of the equivalent ozone layer, based on 27 balloon ascents at Lindenberg, and the detailed ozone data obtained there during July–Oct. 1926 and April–Oct. 1927 (Dobson's method). A stronger correlation exists between ozone thickness and density of air in stratosphere. A model temperature distribution extrapolated on the basis of acoustical soundings to 50 km height shows a warm region in the ozone layer at 40 km, reaching +37°C at 45 km. (*Same item as* 5D–52, April 1954, *Met. Abs.*) *Subject Headings:* **1. Tropopause ozone 2. Ozone data 3. Stratospheric density 4. Temperature of the stratosphere 5. Lindenberg, Germany.**—*M.R.*

12D–88 551.596.1:551.524.7(985)

Gutenberg, B., **The velocity of sound waves and the temperature in the stratosphere in Southern California.** *American Meteorological Society, Bulletin*, 20:192–201, **1939.** 6 figs., 6 refs., 4 eqs. **DWB**—Sound waves from gunfire in Southern California, about 33°N lat., show travel times similar to those observed in Europe and Novaya Zemlya. Concluded that increase in temperature at 30 to 40 km. altitude is approximately the same in these regions. (*Same item as* J–75, Oct. 1950, *Met. Abs.*) *Subject Headings:* **1. Sound velocity 2. Upper air temperatures 3. Southern California 4. Arctic.**

1941–1948

12D–89 551.596.1:551.510.5

Haurwitz, B., **Propagation of sound through the atmosphere.** *Journal of the Aeronautical Sciences*, 9:35–43, **1941.** 8 figs., 3 tables, 10 refs., 20 equations. **DLC**—Geometrical laws of sound propagation discussed, in a calm atmosphere, and considering wind and temperature effects. Region of audibility around a source of sound is asymmetrical according to wind. Zones of anomalous audibility around an explosion are explained by high air temperatures in upper air. (*Same item as* J–79, Oct. 1950, *Met. Abs.*) *Subject Headings:* **1. Audibility zones 2. Sound propagation 3. Upper air temperatures.**

12D–90 551.596.1:551.510.53

Gutenberg, B., Physical properties of the atmosphere up to 100 km. *Journal of Meteorology*, 3:27–30, June 1946. 5 figs., 26 refs., 5 eqs. **DWB**—Results of new calculations of temperature, pressure, density, etc., in stratosphere up to 100 km elevation discussed. Limited treatment and discussion of results of acoustical sounding of stratosphere. (*Same item as* J–91, Oct. 1950. *Met. Abs.*) *Subject Headings:* **1. Acoustical sounding 2. Stratospheric structure.**

12D–91 551.501.724:551.524.7:551.596.1(796)

†Cox, Everett F., **Microbarometric pressures from large high explosive blasts.** *Acoustical Society of America, Journal* 19(5):832–846, Sept. 1947. 14 figs., 2 tables, 28 refs. **DLC**—Discussion of measurements of anomalous and normal pressure waves produced by blasts made near Arco, Idaho during Oct. 1946, and recorded on microbarographs at distances from 13 to 452 km, (in various parts of the Northwest, including one record made near Seattle, Washington). Equipment described and illustrated. Calibration of equipment. Theoretical and empirical aspects of time-measurements. Analysis of abnormal signal arrival times, and normal and abnormal signal strengths, frequencies and durations. At the time this article was written, abnormal sound measurements provided the only method of temperature measurement in the 30 to 60 km portion of the stratosphere. Appendix gives by means of 14 equations, the calculation formulas used. The author concludes that abnormal audibility is not a shock-wave phenomenon. (*Same item as* 1–161, Jan 1950, *Met. Abs.*) *Subject Headings:* **1. Acoustical phenomena. 2. Upper air temperature measurement techniques 3. Arco, Idaho.**

1949

12D–92 551.501.724:551.524.7:551.596.1(435.1)

Cox, Everett F., **Abnormal audibility zones in long distance propagation through the atmosphere.** *Acoustical Society of America, Journal*, 21:6–16, Jan. 1949. 8 figs., table, 16 refs., 16 eqs. **DLC**—Records of Helgoland explosions, April 1947, are reported and discussed. Arrival times of abnormal signals at six stations over 220 km away, supplemented by high altitude meteorological data and the assumption of negligible winds above 30 km, permit upper atmosphere temperature calculations, (maximum of 294°K in temperature hump between 30 and 70 km). This temperature maximum establishes a critical ray which is refracted to infinity. A new explanation for observed outer boundaries of abnormal zones is therefore proposed and substantiated by recorded evidence of dispersion near the temperature maximum. In the signal received near the abnormal zone outer boundary, high frequency content predominates. (*Same item as* J–106, Oct. 1950, *Met. Abs.*) *Subject Headings:* **1. Anomalous sound propagation 2. Upper-air temperature calculations 3. Helgoland, Germany.**—*From author's abstract.*

12D–93 551.510.53:551.507.362.1

McLarren, Robert, **What upper air means to missiles.** *Aviation Week*, 51(8):21–26, Aug. 22, 1949. graphs, 18 refs. **DLC**—Discussion of problems encountered in design of rockets and other vehicles intended for the upper stratosphere. The statement is made that "From sea-level to 35,332 ft. is termed the troposphere. In this region the temperature has a constant gradient of 3.56617°F per 1000 ft. Also the temperature remains at −67°F from 35,332 ft (no inches!!) to 104,987 ft, rises to 170.6°F at 164,042 ft and remains at this value to 196,850 ft, drops to −27.4°F at 225,905 ft. Remains at this value to 272,309 ft and so on. (*Same item as* 9–45, Sept. 1950, *Met. Abs.*) *Subject Headings:* **1. Rocket development 2. Stratospheric structure.**—*M.R.*

12D–94 551.510.53:551.596.1

Regula, Herbert, **Erforschung der Hochstratosphäre durch Schallwellen.** [Investigation of the high stratosphere by explosion waves.] *Meteorologische Rundschau*, 2(9–10):263–267, Sept.–Oct. 1949. 5 figs. **DWB**—Zones of silence and abnormal audibility of explosions point to a strong inversion at 35–40 km. This is confirmed by V-2 ascents. The location of zones of audibility exceeding 150 km, mainly to west in summer and east in winter, agrees with summer and winter winds according to SCHERHAG (1948) from topography of 41 mb surface (ca. 22km.), which are therefore considered to represent whole layer 20–45 km. Further experiments should bring temperatures and winds up to 45 km into discussion of synoptic problems. (*Same item as* 4–40 and 11I–4, *Met. Abs.*) *Subject Headings:* **1. Stratospheric structure 2. Acoustical phenomena 3. Audibility zones.** —*C.E.P.B.*

12D–95 551.510.53:551.524.7:551.557

Regula, Walter, **Temperaturen und Winde in der oberen Stratosphäre.** [Temperatures and winds in the upper stratosphere.] *Meteorologische Rundschau*, 2(9–10):267–270, Sept.–Oct. 1949. fig., table. **DWB**—From the White Sands V-2 ascent and luminous night clouds at 82 km over

Norway on June 30, 1934, author constructs chart of 9.1×10^{-3} mb level over southern Norway. Clouds show wave formation indicating strong inversion at 82 km; from this, various assumptions, and observations of luminous clouds and meteor trails up to 120 km he constructs table for southern Norway. (excerpt):

Height, km	22	47	82	109	123
Pressure, mb	41	0.92	9.1×10^{-3}	1×10^{-4}	1.8×10^{-5}
Temperature °A	230	320	180	265	—
Wind, m/s	E 0	E 35	E 80	E 0	W 42

Above 82 km mean wind is 122 m/sec from west, showing a marked reversal of horizontal temperature gradient. (*Same item as* 4–41 and 4F–45, *Met. Abs.*) *Subject Headings:* **1. Upper air temperatures 2. Upper air winds 3. Upper stratosphere.**—*C.E.P.B.*

1950

12D–96 551.596.1

†*Crary, A. P., **Stratosphere winds and temperatures from acoustical propagation studies.** *Journal of Meteorology*, 7(3):233–242, June **1950.** 16 figs., 7 tables, 12 refs., eq. Also in: *U. S. Air Force. Cambridge Research Center, Geophysical Research Papers*, No. 5, June **1950.** 32 p. 21 figs., 7 tables, 12 refs. **DWB**—Winds and temperatures at 30–60 km. levels are calculated from observations made by acoustical methods in Panama, Bermuda (1948–1949), and in New Mexico and on the east coast of the U. S. at other times. Results indicate lower temperatures than heretofore reduced, owing to wind factor having been neglected. East winds occur generally in summer, and west winds in winter, over Alaska. No diurnal variation in temperature at 30–60 km. was found. (*Same item as* 8–146, Aug. 1950, *Met. Abs.*) *Subject Headings:* **1. Anomalous sound propagation 2. Acoustical phenomena 3. Upper atmosphere temperatures 4. Upper air winds.**—*M.R.*

12D–97 551.596.1:551.524.7

Haskell, Norman A., **Diffraction effects in the propagation of compressional waves in the atmosphere.** *Cambridge, Massachusetts, Air Force Cambridge Research Laboratories, Geophysical Research Papers*, No. 3, March **1950.** 43 p. 13 figs., 2 tables, 9 refs., 10 eqs. **DWB**—An attempt is made to solve the acoustic wave equation asymptotically, for the case where the velocity of propagation depends only on altitude and there is only one minimum value. This approximate solution is applied to the problem of estimating the temperature at 25 to 60 km. on the basis of time of travel for acoustic waves from large explosions to zones of abnormal audibility. The methods, with slight modification, can be equally well applied to problems of long distance, transmission of sound in the ocean, or to particular types of seismic waves. Emphasis is placed on diffraction effects on range and frequency, and useful tables and graphs are included. (*Same item as* 7–135 and 10G–12, *Met. Abs.*) *Subject Headings:* **1. Acoustical phenomena 2. Audibility zones 3. Upper air temperatures.**—*M.R.*

12D–98 551.510.53:523.38:535

Link, F., **Sondages optiques de la haute atmosphère à l'aide des éclipses de lune.** [Optical soundings in the upper atmosphere at lunar eclipse.] *I.U.G.G. Association of Terrestrial Magnetism and Electricity, IATME Bulletin*, No. 13:502–503, **1950.** 3 refs. **DWB**—Calculation of the optical density from the center to the edge of the umbra during a lunar eclipse shows that differences between observed and calculated values (using data on atmospheric density up to 50 km obtained by aerological and acoustical soundings) can only be explained by the influence of atmospheric pollution from 0–100 km—possibly due to meteoric dust. A study of the penumbra of the eclipse of Nov. 19, 1945 gives thus far no clue to the structure of the atmosphere, though a dissymmetry toward the evening side must be further investigated. (*Same item as* 6.4–116, April 1955, *Met. Abs.*) *Subject Headings:* **1. Optical soundings 2. Lunar eclipses 3. Atmospheric pollution 4. Upper atmosphere.**—*M.R.*

12D–99 551.596.1(540)

*Mathur, L. S., **Reflection of sound waves from the stratosphere over India in different seasons of the year.** *Indian Journal of Meteorology and Geophysics*, 1(1):24–34. Jan. **1950.** 7 figs., 3 plates, 3 tables, 3 refs. **DWB**—Three series of observations were made in India during the summer, fall and winter of 1946–1947 to determine the trajectories of sound waves (from explosions) through the stratosphere. Two explosion centers, and nine recording stations (in the form of a cross with the axis along the line joining the two centers) were set up by the Meteorological Department, and their locations shown on a chart. Actual recorder records, for ground waves and reflected waves are reproduced, and derived data presented in tables and graphs. In the summer better reception was

obtained toward the south, whereas, after the monsoon season, and in the winter better records were obtained to the north (up to 294 kms.) of the explosions. Records of the ground wave were obtained even in the "zone of silence." Trajectories are illustrated and temperatures up to 55 km and lapse rates in the stratosphere computed and plotted. (*Same item as* 5–121, May 1950, *Met. Abs.*) *Subject Headings:* **1. Sound waves 2. Atmospheric acoustics 3. Stratosphere 4. India.**—*M.R.*

12D–100 551.510.53:551.524.7

Michigan. University. Engineering Research Institute, **Pressure and temperature measurements in the upper atmosphere.** Contract w-33-038-ac-14050, Final Report, May 11, **1950.** 16 p. photos, graphs. **DWB**—A condensed summary of results of 6 V-2 rocket flights in which the Univ. of Michigan participated (between Aug. 22, 1946 and June 10, 1949). Eleven reports on work are listed and contents of each summarized. It was concluded that the ionization gage offered the best possibilities for measuring density at high altitudes. Either the thermoionic or the radioactive type will give good results. Refinements have been made during the period of use. Detailed photographs and drawings of equipment are presented. Temperature profile (30–110 km) obtained by rocket flight No. 28 (Dec. 1947) is compared with NACA Standard Atmosphere model and with NRL #21 (1947). (*Same item as* 11I–6, Sept. 1950, *Met. Abs.*) *Subject Headings:* **1. Upper atmosphere 2. Ionization gages 3. V-2 rocket flights 4. Standard atmosphere 5. Temperature profiles. I. Spencer, N. W.**—*M.R.*

12D–101 551.510.53:551.507.362.1(789)

†Michigan. University. Engineering Research Institute, **Atmospheric phenomena at high altitudes.** Contract W-36-039 sc-32307, Project DA 3-99-07-022. Final Progress Report for the period July 15, 1946 to Aug. 31, **1950.** 162 p. 157 figs., 38 refs. **DWB**—Upper air measurements carried on by the Institute in conjunction with V-2 and Aerobee firings at White Sands Proving Grounds are reported. The program included investigation of air composition, temperature, pressure and wind direction and velocity between altitudes of 30 and 80 km. Technical details of the instruments developed and of their installation and operation are given on numerous photos and technical drawings. Data obtained are presented in tables and graphs. instruments constructed for their evaluation described and illustrated, calculations and methods used in computing results explained. The complete report comprises every phase of the program. Earlier reports are partially included. (*Same item as* 11I–7, Sept. 1960, *Met. Abs.*) *Subject Headings:* **1. Upper atmosphere research 2. Rocket soundings 3. Rocket instrumentation 4. White Sands, N. Mex. I. Jones, L. M. II. Neill, Howard W.**—*G.T.*

12D–102 551.524.7(789)

*Nazarek, Alex, **The temperature distribution of the upper atmosphere over New Mexico.** *American Meteorological Society, Bulletin,* 31(2):44–50, Feb. **1950.** 3 figs., 2 tables, 11 refs., 3 eqs. Abstract p. 44. **DWB**—Mean temperatures in the region from 15 km. to 129 km computed by applying the hydrostatic equation to pressure data obtained from V-2 rocket soundings over New Mexico. Results compare roughly with other recent vertical-temperature gradient models, except in the area around 100 km where a marked irregularity appears in the lapse rate, probably due to a transition layer of dissociation of molecular into atomic oxygen. Detailed results given in tabular and graphic form. (*Same item as* 4–83, April, 1950, *Met. Abs.*) *Subject Headings:* **1. Upper air temperatures 2. Rocket data 3. New Mexico.**—*M.R.*

12D–103 551.510.53:551.524.7

Strong, John and Plass, Gilbert N., **The effect of pressure broadening of spectral lines on atmospheric temperature.** *Astrophysical Journal,* 112(3):365–379, Nov. **1950.** 4 figs., table, 4 refs., 32 eqs, 2 append. **DLC**—Importance of line width for radiative cooling is shown in schematic diagram of thermal structure of earth's atmosphere (up to 40 km). Transmission at 33,000 ft. from 8 to 26μ shows anomalous bands due to absorption by CO_2, O_3 or H_2O. As a result of data obtained for this study, the radiative balance of the stratosphere is revised. Heat loss from stratosphere in the above bands is balanced by heat gained by absorption of terrestrial radiation in the same bands, and by absorption of UV solar radiation by O_3. (*Same item as* 2.3–51, March 1951, *Met. Abs.*) *Subject Headings:* **1. Stratospheric structure 2. Upper air temperatures 3. Radiation balance.** —*M.R.*

12D–104 551.524.73:551.510.53

***Wexler, Harry, **Annual and diurnal temperature variations in the upper atmosphere.** *Tellus,* 2(4):262–274, Nov. **1950.** 7 figs., 2 tables, 23 refs., 10 equations. **MH-BH**—An attempt is made to determine the annual and diurnal variations of temperature to a height of 80 km. by knitting together available observations and theoretical results. The observations include radiosonde data, meteor-determined densities, V-2 rocket observations, anomalous propagation of sound, and infrared spec-

troscopy. The theory most heavily relied upon is the radiative computation made by GOWAN. For the annual temperature range there is reasonably good agreement between theory and observations, such that in the upper ozonosphere (30 to 55 km), summer temperatures are higher than winter temperatures by amounts as large or larger than those at the surface. As in lower levels, the annual temperature range aloft increases with latitude. For the diurnal temperature variations there is a large disagreement between the computations of GOWAN and PENNDORF. However, available evidence appears to favor GOWAN'S computations, which, together with other considerations, indicate a diurnal temperature range of the order of 10 to 15°C. (*Same item as* 2.8–89, Aug. 1951, *Met. Abs.*) *Subject Headings:* **1. Annual temperature variations 2. Diurnal temperature variations 3. Upper air temperatures.**—*Author's abstract.*

12D–105 551.510.53:551.510.3:523.5:778.3

Whipple, Fred L., **Densities in the upper atmosphere measured by photographic meteors.** *International Union of Geodesy and Geophysics, Association of Meteorology, Transactions, Oslo 1948,* v. 2:184, **1950.** Mimeog. **DWB**—Double station photography of meteors and measurement of meteoric velocity, deceleration, luminosity and height at altitudes from 46 to 93 km above sea level indicate seasonal variations in the density of the upper atmosphere. The seasonal effect was almost 0.5 in the logarithm of the atmospheric density at an average height of 78 km at latitude 42.5°N. The correlation of the residual with the normal mean ground temperature is 0.91, with actual mean ground temperature for the day 0.85 and with the solar insolation 0.66. (*Same item as* 3.5–110, May 1952, *Met. Abs.*) *Subject Headings:* **1. Upper air density 2. Meteor trails 3. Meteor photography.**—*I.L.D.*

1951

12D–106 551.501.71:551.510.3:551.510.53(798)

Bauer, John R. (*Geoph. Inst., Univ. of Alaska*), **Molecular density measurements of the atmosphere up to 61.5 km by means of the searchlight technique.** *International Council of Scientific Unions. Mixed Commission on Ionosphere, 2nd Meeting, Brussels, Sept. 1950, Proceedings,* Pub. **1951.** p. 85–95. 5 figs., 11 refs., 8 eqs. **DWB**—By means of a sensitive photoelectric receiver, the path of a searchlight beam was followed to 61.5 km at College, Alaska, to obtain data on scattering and hence on temperature and density. The transmitter was 5.15 km from the receiver. Observations were made on the clearest and coldest nights when there was a minimum of water vapor: March 11–12 and April 13–14, 1950. Extrapolations from radiosonde data to 15 km are shown graphically to 70 km. *Subject Headings:* **1. Molecular density measurements 2. Stratospheric density 3. Searchlight techniques 4. Air density measurement techniques 5. College, Alaska.** —*M.R.*

12D–107 551.510.534:551.521.17

†Craig, Richard A., **Radiative temperature changes in the ozone layer.** (In: **Compendium of meteorology.** Boston, American Meteorological Society, **1951.** p. 292–302. 4 figs., table, 63 refs., 29 eqs.) **DWB**—A concise review is given about the ozone distribution, the temperature distribution in the ozone layer, the ozone absorption, the photochemistry of ozone and the possible solar effects on ozone, owing to the large variability of UV radiation from the sun. The theory of heating and cooling of the ozone layer is examined and the results of calculations given. The main heating source is the ozone and oxygen absorption in the UV. Rocket flights gave new data on the solar spectrum in the important region 1800 to 3500 Å. Atmospheric gases, responsible for cooling, may be water vapor, carbon dioxide and ozone. (*Same item as* 4.9–3, Sept. 1953, *Met. Abs.*) *Subject Headings:* **1. Ozone layer 2. UV radiation 3. Ozonosphere heating 4. Compendium articles.**—*A.A.*

12D–108 551.510.3:551.510.53:551.501.71:551.508.762

Elterman, Louis, **The measurement of stratospheric density distribution with the searchlight technique.** *U. S. Air Force. Cambridge Research Center, Geophysical Research Papers,* No. 10, Dec. **1951.** 48 p. 30 figs., 6 tables, 12 refs. Also in: *Journal of Geophysical Research,* 56(4): 509–520, Dec. **1951.** 4 figs., table, 9 refs., 10 eqs. Kaplan, Lewis D., **Some comments on L. Elterman's "The measurement of stratospheric density distribution with the searchlight technique."** *Ibid.,* 57(3):426–427, Sept. **1952.** tables, 3 refs. Elterman, L., **A reply to Lewis D. Kaplan's comments on density measurements with the searchlight technique.** *Ibid.,* p. 427–429. ref. **DWB**—Light scattering from a beam, modulated by shutter mechanism and projected into the atmosphere investigated. Sensing device: 60″ parabolic mirror and photo-multiplier tube. Values of atmospheric density obtained assuming Rayleigh scattering and matching response at 15 km with radiosonde measurements at that height. Author discusses theory of measurements, gives technical details and presents data from 8 series of observations up to 62 km. Good agreement with Rand atmosphere. Slight seasonal variations. In the comment by KAPLAN, he suggests that impossible

pressures and temperatures obtained by extrapolating ELTERMAN'S curves with a trapezoidal
make any conclusions regarding seasonal variation of density in the region above 20 km unjust
LOUIS ELTERMAN in reply to comment by KAPLAN states that he did not intend to have his techni
which are merely exploratory subjected to rigid quantitative evaluation at this stage—he m
wanted to show that the method permitted the first successful measurement of light scattered
beam to a height of 68 km. Further refinements should eliminate some of the difficulties
inaccuracies. (*Same item as* 4.8-73, Aug. 1953, *Met. Abs.*) *Subject Headings:* **1. Stratosp
density 2. Searchlight technique 3. Stratospheric scattering.**—*A.A., M.R.*

12D–109 551.596.1:551.5

†Gutenberg, B., **Sound propagation in the atmosphere.** (In: **Compendium of meteoro**
Boston, American Meteorological Society, **1951.** p. 366–375. 14 figs., table, 30 refs., 34
DWB—The theory of sound waves in gases, the equations for velocity of sound in quiet ar
moving air and the energy of sound waves in the atmosphere are first considered in detail.
instruments for recording sound waves (microbarographs) and their limitations are discu
Observations and records from microbarographs of sound propagation through the troposphere
the stratosphere, and abnormal audibility zones are treated in the last part of this paper. Nume
illustrations are presented to show types of records, areas of abnormal audibility from explo
(Germany, 1925 and Vergiate, Italy, Nov. 1920), travel time curves from explosions, cross sec
showing typical paths of soundwaves, and temperature and sound velocity profiles from V-2 fl
and sound propagation data. Problems of wind effect and of natural pressure waves in atmosp
are among the most important for future study. (*Same item as* 4.3–5, March 1953, *Met.*
Subject Headings: **1. Acoustical propagation 2. Microbarographs 3. Explosion waves 4. C
pendium articles.**—*M.R.*

12D–110 551.524.7:551.5

Kölzer, Joseph, **Über den Stand der Frage des Schalltransportes auf weite Entfernungen.**
the state of the problem of sound transmission over long distances.] *Meteorologische Rundsc*
4(7–8):138–141, July–Au **1951.** 5 figs., tables, 12 refs. **DWB**—Various hypothetical and obse
temperature distributions up to 90 km, are discussed. Reconstructions of sound paths from e
sions and reflection levels are then considered in relation to temperature distribution. (*Same
as* 3.2–105, Feb. 1952, *Met. Abs.*) *Subject Headings:* **1. Upper air temperatures 2. Audi
zones.**—*C.E.P.B.*

12D–111 551.510.53

†Koteswaram, P., **Physical properties of the upper atmosphere over India.** *Indian Journ
Meteorology and Geophysics*, 2(2):101–112, April **1951.** 7 figs., 8 tables, 24 refs. **DWB**—On
basis of radiosonde data and sound propagation experiments, the author constructed a height
perature curve from the ground up to 100 km for Central India. An isothermal layer is abse
the lower stratosphere over India; the temperature increases steadily above the tropopause.
monthly variations in temperature, pressure and density up to the levels of 20 km. are prese
graphically and in tables. Data on monthly geostrophic wind velocities at heights up to 20 k
latitudes 20° to 30°N are given. At all levels, westerly winds prevail in winter and easterly w
in summer. (*Same item as* 2.11–57, Nov. 1951, *Met. Abs.*) *Subject Headings:* **1. Stratosperic st
ture 2. Radiosonde data 3. India.**—*I.L.D.*

12D–112 551.510.53:551.524.7:551

Newell, Homer E., Jr., **Temperatures and pressures in the upper atmosphere.** (In: C
pendium of meteorology. Boston, American Meteorological Society, **1951.** p. 303–310. 8
20 refs., 3 eqs.) **DWB**—The sources of our knowledge of temperatures and pressures in the u
atmosphere are balloon studies, propagation of sound, ozone heating, free oscillations, meteor
rocket measurements. The theory and praxis of these methods are examined and the results
summarized. Wide differences in the temperatures and pressures ascribed to the upper atmosp
are found in the literature. The number of rocket measurements is still too small to give more e
average results. Graphs show results obtained from a balloon flight up to 42 km, from so
velocities up to 49 km, from ultraviolet absorption in the ozonosphere up to 53 km and from ro
flights up to 125 km. The most probable temperature distribution is 220°K at 30 km height, 35
55 km, 240° at 80 km, upwards temperature increases sharply (380°at 120 km height). (S
item as 4.9–5, Sept. 1953, *Met. Abs.*) *Subject Headings:* **1. Upper atmosphere 2. Vertical temp
ture gradient 3. Pressure gradient 4. Compendium articles.**—*A.A.*

12D–113 551.510.535:551.521.6:551.5

Pawsey, J. L., McCready, L. L. and Gardner, F. F., **Ionospheric thermal radiation at r
frequencies.** *Journal of Atmospheric and Terrestrial Physics*, 1(5/6):261–277, **1951.** 9 figs., 2 ta

6 refs., eqs. **DWB**—Minimizing man-made radio noises and atmospherics, the thermal radiation from the ionosphere has been identified and measured. The electron temperature at 70–80 km was found to be 240–290°K. This paper describes the equipment used and shows how to distinguish between different noises. (*Same item as* 4.6–83, June 1953, *Met. Abs.*) *Subject Headings:* **1. Ionospheric radiations 2. Radio noise 3. Temperature of the ionosphere.**—*A.A.*

1952

12D–114 551.501.71:551.510.3:551.510.53

Alaska. University. Geophysical Institute, **Searchlight technique for exploring the atmosphere.** Contract AF 19(604)-108, Final Report, Nov. 1, 1951 to Oct. 31, **1952.** 6 p. graphs, diagrs., refs. **DWB**—The measurement of the density of the atmosphere by the searchlight technique has been investigated. With the present apparatus, useful measurements are limited to approximately 45 km, due to the noise introduced by the background light from the night sky. It is shown that a significant improvement in the results can be made only by increasing the intensity of the searchlight beams. A method for decreasing the effect of the background noise is discussed. (*Same item as* 5.3–110, March 1954, *Met. Abs.*). *Subject Headings:* **1. Searchlight techniques 2. Atmospheric density.**—*Author's abstract.*

12D–115 551.510.3:551.521.16:551.593.55

†Ashburn, Edward V. (*U. S. Naval Ord. Test Station, Inyokern, China Lake, Calif.*), **The density of the upper atmosphere and the brightness of the twilight sky.** *Journal of Geophysical Research*, 51(1):85–93, March **1952.** 5 figs., 2 tables, 25 refs. **DWB**—The intensity of the zenith skylight was measured for solar zenith angle of 90° to 106° for wavelength of 0.75μ, 0.52μ and 0.44μ. The polarization was measured for the 0.44μ region. The difference between the measured polarization and the computed polarization of the primary scattered light was used to determine the fraction of the total zenith skylight that was due to primary scattered zenith skylight contains an extinction term. It was shown that the extinction term can be evaluated most accurately for the blue light. The computed atmospheric densities agree with the N. A. S. A. tentative standard atmosphere up to 120 km. (*Same item as* 4.1–77, Jan. 1953, *Met. Abs.*) *Subject Headings:* **1. Atmospheric density 2. Twilight sky brightness.**—*Author's abstract.*

12D–116 551.596.1:551.510.5(435.1)

aufm Kampe, Hans Joachim, **Ergebnisse der Schallmessung Helgoland.** [Results of acoustic measurement at Helgoland.] *Meteorologische Rundschau*, 5(5/6):99–105, May/June, **1952.** 12 figs., 2 tables, 3 eqs. **DWB**—On April 18, 1947, 6000 tons of explosive were set off at Helgoland; normal and anomalous waves recorded at German stations are charted up to a distance of 440 km. Results are discussed in the light of upper winds and temperatures and the weather situation, and the paths of anomalous waves plotted, with some alternative solutions. Above tropopause at 10 km a rise of temperature is determined, to a value of nearly 50°C at 50 km. (*Same item as* 4.3–295, March 1953, *Met. Abs.*) *Subject Headings:* **1. Explosion waves 2. Acoustical soundings 3. Helgoland, Germany.** —*C.E.P.B.*

12D–117 551.510.535:551.507.362.1

*Beth, Eric W. (*AF Cambridge Res. Center*), **Altitude dependence of some upper atmosphere properties.** *U. S. Air Force. Cambridge Research Center, Geophysical Papers*, No. 11:255–262, **1952.** 5 figs., 7 refs. **DWB**—Rocket research results of some investigators are reported for equivalent electron density at heights up to 143 km, ion density around 100 km, and for pressure, kinetic temperature and density of the air between 40 and 100 km. The last three quantities are shown in approximate graphs. The investigation of ion density is still in its initial stage. The equivalent electron density was measured during a magnetic storm; between 110 and 139 km the altitude dependence of electron density was unimportant, its average value being about $1.3 \pm 0.2 \times 10^5$ electrons/cm^3. Below 95 km the concentration was too small to be detected. Between 95 and 110 km the ionized region was found to have a patchy or "spongy" structure. (*Same item as* 4.11–98, Nov. 1953, *Met. Abs.*) *Subject Headings:* **1. Ionospheric composition 2. Electron density 3. Ion density 4. Air density 5. Rocket research.**—*Author's abstract.*

12D–118 551.510.53:551.524.7

†Chapman, Sydney and Price, W. C., **The upper atmosphere.** *Physical Society of London, Reports on Progress in Physics*, 3:42–65, **1936.** Pub. 1937, reprinted **1952.** table, 51 refs., eqs. **DLC** —A literature review summarizing progress from 1922 to 1936. Shows how to utilize barothermograph readings, gives calculations of upper atmospheric distribution, discusses sound propagation,

the temperature above 50 km, chemical and physical transformation, corpuscular radiation, absorption of solar radiation, etc. (*Same item as* 5.8–90, Aug. 1954, *Met. Abs.*) *Subject Headings:* **1. Upper atmosphere 2. Upper air temperatures 3. Review articles.**—*A.A.*

12D–119 551.596.1:551.524.7:551.557.2

Crary, A. P., **Stratosphere winds and temperatures in low latitudes from acoustical propagation studies. Journal of Meteorology**, 9(2):93–109, April **1952.** 22 figs., 8 tables, 11 refs. **DWB**—Tests of sound-ranging method (*see item* No. 8–146, Aug. 1950, *Met. Abs.*) near Hawaii, Canal Zone, Bermuda and Florida described and velocity-height curves up to 40–60 km (100–120 km near Florida) are presented. Most probable temperatures and winds are deduced. Results confirm earlier studies, showing light winds over continental areas in low latitudes in winter and low temperatures and high winds over oceanic areas. The sources of error in the experimental method are discussed. (*Same item as* 3.9–240, 4F–92 and 10G–29, *Met. Abs.*) *Subject Headings:* **1. Acoustical soundings 2. Upper air temperatures 3. Upper air winds.**—*C.E.P.B.*

12D–120 551.501.724:551.524.7

Grandmontagne, R., **Remarques sur le calcul des températures de l'atmosphère.** [Notes on the calculation of atmospheric temperature.] *Annales de Géophysique*, 8(4):443–446, Oct./Dec. **1952.** 2 figs., 3 tables, 2 refs. Also Penndorf, R., **Remarks to the note by R. Grandmontagne.** *Ibid.*, 10(3):248, July/Sept. **1954.** table. Commentary in French by Grandmontagne. **DLC**—After determining the correlation between pressure and temperature variation with height, the author computes air temperature between 43 and 71.5 km altitude. The values presented are based on data obtained in rocket flights reported by Havens, Koll and LaGow. Three temperature maxima are identified (296° at 45 km; 312° at 53.25 km and 410° at 67 km). Penndorf's remark to this comment states, that stratospheric temperature data should not computed from raw pressure data due to their inherent errors. Physically impossible superdiabatic gradients are obtained otherwise. (*Same item as* 9.1–217, and 11I–24, *Met. Abs.*) *Subject Headings:* **1. Upper air temperatures 2. Rocket data.**—*G.T., A.A.*

12D–121 551.524.7

†Kellog, William Welch (*The Rand Corp., Santa Monica, Calif.*), **Temperatures and motions of the upper atmosphere.** (In: U. S. School of Aviation Medicine, Randolph Field, Texas, **Physics and medicine of the upper atmosphere.** Albuquerque, **1952.** p. 54–74. 5 figs., 49 refs.) **DLC**—The various techniques which have yielded knowledge of upper atmospheric temperatures and winds are described briefly and some of the results obtained are presented. These techniques are rockets, high level balloons, sound propagation, radio wave propagation, meteor observations, noctilucent clouds, airglow and aurora, ozone concentration studies, tidal oscillations, dynamo theory and radiation heat exchange. Seasonal change of upper atmospheric temperatures, temperature versus height relationships, wind velocities and the general circulation in the upper atmosphere below 120 km are discussed. (*Same item as* 4.6–132, June 1953, *Met. Abs.*) *Subject Headings:* **1. Upper air temperatures 2. Upper air temperature measurement.**—*I.L.D.*

12D–122 551.524.7:551.590.21

Scherhag, Richard, **Die explosionsartigen Stratosphärenerwärmungen des Spätwinters 1951/1952.** [The explosion-like stratospheric warmings of the late winter 1951/1952.] *Germany. Deutscher Wetterdienst in der US-Zone, Berichte*, No. 38:51–63, **1952.** 10 figs., 8 tables, 13 refs. German and English summaries p. 51–52. **DWB**—In 1951–52 radiosondes from Berlin reached heights of 30–40 km. These showed at high levels in winter rapid rises of temperature by 30–50°C. Examples tabulated are Jan. 25–30 and Feb. 22–29, 1952. Similar changes are quoted at Copenhagen and Thule and the change on Feb. 22–29 at 41 mb is mapped. The changes are associated with daily magnetic activity and attributed to solar eruptions. The corresponding sudden surface pressure changes lead to errors in weather forecasts. (*Same item as* 4.2–148, Feb. 1953, *Met. Abs.*) *Subject Headings:* **1. Upper air temperatures 2. Solar influences 3. Stratospheric warming.** —*C.E.P.B.*

12D–123 551.524.7:551.510.53(432.1)

Scherhag, R., **Ein Jahr Berliner Hochaufstiege.** [A year of high ascents at Berlin.] *Annalen der Meteorologie*, 5(7/12):320, **1952. DWB**—A new type of American sonde and large balloon were introduced on Jan. 9, 1951. Difference of 1.5°C between noon and midnight at 30–20 mb is regarded as real. Annual variation at 40,000 m exceeded 40°C, greatest rise on Feb. 23, with change of wind to E and a solar eruption. (*Same item as* 5.6–151, June 1954, *Met. Abs.*) *Subject Headings:* **1. Stratospheric temperatures 2. Berlin, Germany.**—*C.E.P.B.*

12D–124 551.510.53:551.590.25

†Whipple, Fred L. (*Harvard Col. Obs.*), **Exploration of the upper atmosphere by meteoritic techniques.** *Advances in Geophysics*, N. Y., 1:119–154, **1952.** 7 figs., 4 tables, 74 refs. **DLC**—A comprehensive review of the entire field of meteor observation and the use of meteors in upper atmosphere research. Meteors, meteorites and meteroids; meteoritic dust or micrometeorites, meteor trails and meteor trains, meteor showers, etc. are defined or distinguished one from another. Visual, photographic, spectral, radio and micrometeoritic techniques in observation and results thereform are discussed in separate paragraphs. Use of this data and theories pertinent thereto, in determining the density, temperature and pressure of the stratosphere and, finally, the estimation of winds at the 40 to 110 km levels from meteor train observations, and recently from radio reflection (Body-Doppler) measurements involving ionization, persisting after the meteor has been consumed, are summarized. (*Same item as* 4.9–10, Oct. 1953, *Met. Abs.*) *Subject Headings:* **1. Meteor research 2. Ionospheric winds 3. Stratospheric structure 4. Review articles 5. Advances in geophysics.** —*M.R.*

12D–125 551.543.1:551.510.5 550.385.25:551.543.1

†Wilkes, M. V., **World-wide oscillations in the earth's atmosphere.** *Royal Meteorological Society, Quarterly Journal*, 78(337):321 336, July **1952.** 9 figs., 27 refs. **DWB**—This general survey describes briefly the 12-hour oscillation of barometric pressure, the small semidiurnal lunar atmospheric tide, and the resulting lunar variations of temperature and of the height of the E region. The resonance theory of the 12-hour wave is discussed, and it is shown that with a low-temperature boundary at about 80 km there are two possible oscillations, one weakening with height, the other with a node at 30 km. The origin of the 12-hour wave (thermal or gravitational) is left open. The dynamo theory of magnetic variations, the lunar tide in the ionosphere, and tidal motion in the F region are briefly discussed. (*Same item as* 3.10–180, Oct. 1952, *Met. Abs.*) *Subject Headings:* **1. Diurnal pressure variations 2. Lunar diurnal variations 3. Ionospheric tides.**—*C.E.P.B.*

1953

12D–126 551.524.7:551.507.362.1(789)

aufm Kampe, H. J., **Neuere Stratosphärendaten.** [New stratosphere data.] *Meteorologische Rundschau*, 6(5/6):99–100, May/June **1953.** fig. **DWB**—Some rockets were built in Peenemünde for investigations up to 60 km. Work was continued by U. S. Rocket Panel. Six temperature-height curves obtained by different methods at White Sands are shown and discussed. (*Same item as* 5.3–197, March 1954, *Met. Abs.*) *Subject Headings:* **1. Temperature profiles 2. Rockets 3. White Sands, New Mexico.**—*C.E.P.B.*

12D–127 551.596.1:551.557:551.524.7(798)

Crary, A. P., **Annual variations of upper air winds and temperatures in Alaska from acoustical measurements.** *Journal of Meteorology*, 10(5):380–389, Oct. **1953.** 4 figs., 3 tables, 7 refs. **DWB**—Acoustical soundings at College, Alaska, 1950–51, are tabulated. Upper winds at 10–15 km averaged easterly 5–10 m/s in summer, variable 20–35 m/s in other months. At 50 km they were generally southerly in all months. Temperature shows a maximum (22–36°C) about 47 km in summer, and probably below 10°C at 50–60 km in winter. (*Same item as* 5.3–226, March 1954, *Met. Abs.*) *Subject Headings:* **1. Acoustical soundings 2. Upper air temperatures 3. Upper air winds 4. Alaska.** —*C.E.P.B.*

12D–128 551.501.7:551.510.53(789):551.508.762:551.524.7

*Elterman, L. (*U. S. A. F. C. R. C., G. R. D., Cambridge, Mass.*), **A series of stratospheric temperature profiles obtained with the searchlight technique.** *Journal of Geophysical Research*, 58(4): 519–530, Dec. **1953.** 9 figs., 4 tables, 3 refs. **DLC**—Measurements of atmospheric densities have been made with the searchlight technique, using improved instrumentation. The density distributions are sufficiently accurate so that corresponding temperature profiles are readily obtained. The density-temperature equation requires the evaluation of an integration constant, which is accomplished by using radiosonde information and, in addition, considering physically acceptable temperature lapse rates. Five temperature profiles are obtained which represent stratospheric conditions over New Mexico during Oct. 1952. The average temperature maximum is 313°K. The average temperatures are calculated to 67.6 km. (*Same item as* 6.6–159, June 1955, *Met. Abs.*) *Subject Headings:* **1. Searchlight soundings 2. Stratospheric temperatures 3. New Mexico.**— *Author's abstract.*

12D–129 551.524.7:551.593.55

Grandmontagne, Raymond, **Température de l'atmosphère et discontinuités crépusculaires.** [Temperature of the atmosphere and twilight discontinuities.] *Académie des Sciences, Paris,*

Comptes Rendus, 236(10):1066–1067, March 9, **1953.** refs. **DWB**—The extremely high perature found at 50 or 60 km (440°K) was thought to be the cause of the sudden discontinui twilight (GAUZIT and GRANDMONTAGNE, 1942). Recent evidence from rocket flights in the and twilight measurements in France leads the author to believe that the steep temperature grad in the 50–60 km zone are really the cause of such discontinuity. (*Same item as* 5.3–199, March *Met. Abs.*) *Subject Headings:* **1. Stratospheric temperature maximum 2. Twilight discontinu** —*M.R.*

12D–130 551.524.7:551.510.534

Johnson, Francis S. (*U. S. Naval Research Lab., Wash., D. C.*), **High-altitude diurnal perature changes due to ozone absorption.** *American Meteorological Society, Bulletin*, 34(3):106– March **1953.** 5 figs., 14 refs. **DWB**—The heating effect due to absorption of solar energ atmospheric ozone was calculated from direct measurements of ozone concentrations and o ultraviolet spectral intensity of sunlight made during a rocket flight over New Mexico on Jun 1949. Assuming a constant rate of heat loss throughout the day and night due to infrared emis and no temperature change from day to day, the diurnal temperature change was found to maximum value of 5.3°C at 48 km, falling to 10° at 31 km and 70 km. (*Same item as* 4.11–164 11I–31, *Met. Abs.*) *Subject Headings:* **1. Stratospheric temperatures 2. Ozone absor 3. Rocket data 4. New Mexico.**—*Author's abstract.*

12D–131 551.510.534:551.524.7(2

Vassy, E. and Vassy, A., **Température moyenne de l'ozone atmosphérique.** [Mean temper of atmospheric ozone.] *Indian Academy of Sciences, Proceedings, Sec. A*, Bangalore, 37(2):195 Feb. **1953.** 2 figs., 19 refs., 6 eqs. **DLC**—It is shown how the spectroscopic determination of temperature in the stratosphere would make possible the regular observation of the mean tem ture of the atmosphere up to 70 km or so, rather than to 30 km as can be done with radioso also the determination of the daily, seasonal, annual and regional variations in temperature o high atmosphere would be possible; more data are needed on the amount (depth) of ozone i ozone layer. Laboratory spectroscopy of ozone by the authors has enabled them to define temperature (1936) and to make observations at several places in France and the Alps (Mt. B Jungfraujoch, etc.) since 1935. (*Same item as* 5.1–112, Jan. 1954, *Met. Abs.*) *Subject Head* **1. Ozone spectroscopy 2. Ozonosphere temperature measurement techniques 3. Alps.**—*M.*

1954

12D–132 551.501.8:551.507.362.1:551.5

Appleton, Sir E., **Finding things out with radio and rockets.** *Advancement of Science*, Lo 10:355–364, **1954. GB-MO**—Good popular account of exploration of the atmosphere by bal radiosonde and rocket (mainly determination of temperature stratification up to 85 km altitude and of the ionosphere by radio pulses of different frequencies. Author continues with inform from solar radiations and meteors, and ends with a discussion of the possibility of space t (*Same item as* 6.9–84, Sept. 1955, *Met. Abs.*) *Subject Headings:* **1. Radio echoes 2. Roc 3. Upper atmosphere research.**—*C.E.P.B.*

12D–133 551.524.7:551.557:551.

Crary, A. P.; Kennedy, William B. and Bushnell, Vivian C., **Atmospheric winds and tem tures at heights up to 60 kilometres as determined by acoustical propagation studies.** (In: Ame Meteorological Society and Royal Meteorological Society, **Proceedings of the Toronto Met logical Conference, Sept. 9–15, 1953.** pub. **1954.** p. 9–13. 5 figs., table, 6 refs.) **DWB**—Re of measurements of temperature profiles up to 50 km, maximum wind speed and wind azimu Canal Zone, Florida, New Mexico, Bermuda, Colorado and Alaska, from anomalous sound t mission of explosions, are presented in a table and charts and discussed. (*Same item as* 6.3– and 10G–52, *Met. Abs.*) *Subject Headings:* **1. Stratospheric temperatures 2. Stratospheric w 3. Acoustical soundings.**—*C.E.P.B.*

12D–134 551.510.3:551.510.53:551.508.762

*Elterman, L., **Seasonal trends of temperature, density, and pressure in the stratosphere tained with the searchlight-probing technique.** *U. S. Air Force. Cambridge Research C. Geophysical Research Papers*, No. 29, July **1954.** 70 p. 22 tables, 34+figs. (fold.), 12 refs. **DW** Light-scattering measurements from a searchlight beam were carried out in the vicinity of Albu que, New Mexico, during the period 29 May through 23 Oct. 1952. Data were acquired on tributions of density, temperature, and pressure to an altitude of 67.6 km. The density inform was obtained by formulating an expression based on the following: Rayleigh scattering, search geometry, attenuation in the atmosphere, and the characteristics of the instrumentation. Fro

density distributions obtained, corresponding temperature profiles were derived. The density-temperature equation required the evaluation of an integration constant, which was accomplished by using radiosonde information and physically acceptable temperature lapse rates. With the densities and temperatures established, the pressure distribution was obtained from application of the gas equation of state. Ninety sets of measurements were obtained during 18 nights when the sky was clear and moonless. Density distributions and temperature profiles are presented for each night. Monthly averages were calculated so that the presence of seasonal trends could be determined. An overall representation of stratosphere conditions over New Mexico, based on the average of 90 sets of measurements, is submitted. (*See also* 6.8–138, Aug. 1955, *Met. Abs.*) (*Same item as* 6.11–162, Nov. 1955, *Met. Abs.*) *Subject Headings:* **1. Searchlight techniques 2. Stratospheric temperatures 3. Stratospheric density 4. Stratospheric pressure 5. Seasonal trends 6. Albuquerque, N. Mex.**—*Author's abstract.*

12D–135 551.510.5:551.508.762.89(789)

Elterman, Louis, **Seasonal trends of temperature, density, and pressure to 67.6 km obtained with the searchlight probing technique.** *Journal of Geophysical Research*, 59(3):351–358, September **1954.** 7 figs., 2 tables, 4 refs. **DWB**—Ninety sets of measurements provided means of temperature, density and pressure mainly for June, Sept. and Oct. 1953 above New Mexico. The familiar picture of a temperature minimum at 18 km and a maximum around 48–52 km was obtained with a well expressed seasonal variation above this height. Temperature profiles measured within 48 hours agreed well up to 50 km and showed large variations above this height. Simultaneous searchlight, rocket, anomalous sound and radiosonde temperature measurement carried out within a 14-hour period, lead to similar results. The anomalous sound measurements, however, give consistently lower temperatures than the searchlight technique. (*Same item as* 6.8–138, Aug. 1955, *Met. Abs.*) *Subject Headings:* **1. Searchlight techniques 2. Upper atmosphere 3. High altitude profiles 4. Albuquerque, N. Mex.**—*A.A.*

12D–136 551.508.93:551.510.3

Hey, J. S. and Smith, P. G., **A comparison of pulsed and modulated light beam methods of measuring upper atmosphere air densities.** *Great Britain. Ministry of Supply, Radar Research Establishment, R. R. E. Memorandum*, No. 1136. May **1954.** 6 p. figs., 3 refs., 12 eqs. Mimeo. **GB-MO**—The use of light pulses of a few microseconds in a vertical beam with transmitter and receiver less than 250 m apart, to explore density up to 60 km, is discussed. It is found that sensitivity equal to that of the modulated beam method could be attained. (*Same item as* 8.2–87, Feb. 1957, *Met. Abs.*) *Subject Heading:* **1. Upper atmosphere density measurement.**—*C.E.P.B.*

12D–137 551.510.534:551.524.7:551.507.362.1(789)

Johnson, Francis S., **Rocket observations of atmospheric ozone.** (In: American Meteorological Society and Royal Meteorological Society, **Proceedings of the Toronto Meteorological Conference, Sept. 9–15, 1953.** pub. **1954.** p. 17–26. 11 figs., table, 18 refs.) **DWB**—Measurements of atmospheric ozone concentration have been made from rockets at altitudes up to 70 km. The results have been compared with distributions calculated from photochemical theory, and the agreement is good if the three-body collision process $O+O+M \rightarrow O_2+M$ is taken into account. The absorption of solar radiation by ozone has been used to calculate the diurnal temperature changes in the altitude range 30 to 70 km above White Sands, N. Mex., for 14 June 1949 and 25 January 1951. The maximum diurnal temperature variation occurs at about 50 km altitude, in agreement with the altitude of the temperature maximum as calculated from rocket measurement of pressure and density. (*Same item as* 6.3–53, and 11I–43, *Met. Abs.*) *Subject Headings:* **1. Ozone distribution 2. Upper air temperature variations 3. Rocket soundings 4. White Sands, N. Mex.**—*Author's abstract.*

12D–138 551.510.53:551.501.8:551.590.25

Kaiser, T. R. (*Jordell Bank Experimental Station, Univ. of Manchester*), **A new technique in upper atmosphere research.** (In: Boyd, R. L. F.; Seaton, M. J. and Massey, H. S. W. (*eds.*), **Rocket exploration of the upper atmosphere.** London, Pergamon, **1954.** p. 108–111. 2 figs., 12 refs., 2 eqs.) **DWB**—Values of atmospheric pressure, scale height, and wind velocity as a function of height (within a somewhat restricted range about 90 km) may be deduced from radio echo measurements of meteor heights and range drifts. (*Same item as* 8H–104, Aug. 1957, *Met. Abs.*) *Subject Headings:* **1. Upper atmosphere research 2. Upper air pressures 3. Upper air winds 4. Radio echo meteor soundings.**—*Author's abstract.*

12D–139 551.596.1:551.557:551.524.7

†Kennedy, William B. and Brogan, Lee, **Determination of atmospheric winds and temperature in the 30–60 km region by acoustic means (a study of annual and diurnal variations).** Denver Univ. Denver Research Institute, Contract AF 19(122)-252, Final Report, June 30, **1954.** 97 p. 21 figs.,

9 tables, 87 refs., 78 eqs. **DWB**—The annual variation of winds and temperatures in the 30–60 km region (Colorado, July 1950–Aug. 1952) and their diurnal variation (New Mexico, Oct. 20–24, 1952) were investigated by means of acoustic propagation studies with explosive sources. The report includes discussion of the calculations involved, tables and graphs of data obtained, and conclusions reached. Strong westerly winds were found to prevail in winter and weak easterly winds in summer. During daytime the wind force was found to decrease while temperature increased. The report includes discussion of possibilities of acoustic sounding involving non-explosive sources. Abstracts of **Scientific Reports** 1–4 published under the contract are appended. (For Report 1. (published version) *see* 4F–117, June 1953; Report 2., 6.4–216, April 1955; Report 3., 6.3–186, March 1955 and Report 4., 6.3–187, March 1955, *Met. Abs.*) (*Same item as* 6.7–345, July 1955, *Met. Abs.*) *Subject Headings:* **1. Acoustical soundings 2. Upper air temperature measurement techniques 3. Upper air wind measurement techniques.**—*G.T.*

12D–140 551.510.4:551.507.362.1

Michigan. Univ. Engineering Research Institute, **Atmospheric phenomena at high altitudes.** Contract DA-36-039-SC-15443, Project DA 3–99–07–22, Project SC 172B, Final Report, Jan 1, 1952–Oct. 15, 1954. issued Dec. 31, **1954.** 21 p. 10 figs., 3 tables, 14 foot-refs., bibliog. p. 20, eq. **DWB**—The results of the development of the air-sampling technique using rockets are described. The results of the analysis of air samples collected in three rocket flights are given together with a brief description of two flights. Possible interpretations of the measurement of diffusive separation in the samples are discussed. The designs of air-sampling instrumentation for subsonic sampling and of a new sample analyzer are described. The design, operation and results of the sphere method for density and temperature are described. The significance of the results obtained is discussed, and recommendations for further research are made. (*Same item as* 8.6–175, June 1957, *Met. Abs.*) *Subject Headings:* **1. Air sampling and analysis 2. Rocket soundings. I. Jones, L. M.**—*Author's abstract.*

12D–141 551.510.53:531.52.551.510.3

Michigan University. Signal Corps Upper Atmosphere Research Project. **Falling sphere method for upper air density and temperatures.** (In: Boyd, R. L. F.; Seaton, M. J. and Massey, H. S. W. (*eds.*), **Rocket exploration of upper atmosphere.** London, Pergamon, **1954.** p. 98–107, 9 figs., table, refs.) **DLC, DWB**—A method of calculating upper atmosphere densities and temperatures from the measured velocities and accelerations of a falling sphere is described. The paper gives information concerning sphere apparatus and the DOVAP (Doppler radar) tracking system. Equations are given, and sources and magnitudes of errors are discussed. The results from one Aerobee flight are shown, and this flight and two others from which the data are being reduced are described. (*Same item as* 11I–38, Sept. 1960, *Met. Abs.*) *Subject Headings:* **1. Upper atmosphere density measurements 2. Upper air temperature measurement techniques 3. Falling sphere method.**—*E.K.*

12D–142 551.507.362.1:551.501.724

Minzner, Raymond A.; Dubin, Maurice and Beth, Eric W. (*U. S. A. F. Cambridge Res. Center, GRD, Mass.*), **Ambient temperature determination from yawing rockets in the presence of winds.** (In: Boyd, R. L. F.; Seaton, M. J. and Massey, H. S. W. (*eds.*), **Rocket exploration of the upper atmosphere.** London, Pergamon, **1954.** p. 17–26. 3 figs., 6 refs., 36 eqs.) **DWB**—Two physical measurements on the wedge shaped or conical surface of a rocket and trajectory data determine two kinds of ambient temperature and limited wind information. In the absence of winds, the method does not require isentropic flow conditions and is therefore independent of the geometry of the rocket. With a knowledge of aspect, the method may be extended to the measurement of complete wind vector. A description of a plausible instrumentation for measurement of required quantities is also presented. (*Same item as* 6.11–120, Nov. 1955, *Met. Abs.*) *Subject Headings:* **1. Rocket observation techniques 2. Temperature measurement techniques.**—*Authors' abstract.*

12D–143 551.524.7:551.557:551.510.534(43)

Regula, Herbert, **Temperaturen und Winde in der Ozonschicht zur Zeit der Oldebroek-Sprengung.** [Temperature and winds in the ozone layer at the time of the Oldebroek explosion.] *Meteorologische Rundschau*, 7(3/4):57–59, March/April **1954.** 2 figs., table, 4 refs., 4 eqs. **DWB**—Temperature and wind profiles of Oldebroek explosions of Dec. 15, 1932, are recalculated. Temperature was −57°C at 30 km rising slowly to −48° at 38 km, then rapidly to +31°C at 48 km. Maximum in ozone layer is estimated as +50° at 50–55 km. Wind speed: 22 m/s at 10.5 km, 17 at 17 km, mean direction 250°. Then increased from 290° and reached 76 m/s at 40 km and probably 80–100 m/s at 50 km. (*Same item as* 5.8–148, Aug. 1954, *Met. Abs.*) *Subject Headings:* **1. Upper air temperatures 2. Upper air winds 3. Ozone layer 4. Oldebroek, Germany.**—*C.E.P.B.*

12D-144 551.507.362.1:551.510.53

Sacinski, H. S.; Spencer, N. W. and Dow, W. G. (*Michigan Univ.*), **Rocket measurements of upper atmosphere and pressure in the 30- to 75-kilometer region.** *Journal of Applied Physics*, N. Y., 25(2):161–168, Feb. **1954.** 12 figs., 14 refs. **DWB**—A method for determining ambient temperature and ambient pressure in the upper atmosphere is described, using the properties of a supersonic flow field surrounding a right circular cone. The underlying fundamentals stem from basic aerodynamic principles as combined with the developments of the aerodynamics of supersonic cones by G. I. Taylor, J. W. Maccoll and A. H. Stone. The experiment provides the necessary cone pressures, velocities and Eulerian angles, such that a Mach number characterizing the ambient space conditions may be computed. A description is given of the requisite experimental equipment and related techniques. Experimental data from two rocket-borne equipments are presented with the resulting calculated pressures and temperatures as experienced over New Mexico to approximately 70 kilometers. (*Same item as* 5.10–52, and 11I–49, *Met. Abs.*) *Subject Headings:* **1. Rocket observation techniques 2. Upper atmosphere research.**—*Authors' abstract.*

12D-145 551.501.724:551.524.7:551.507.362.1

Weisner, Allan G. (*Signal Corps Eng. Labs., Ft. Monmouth, N. J.*), **The determination of temperatures and winds above thirty kilometers.** (In: Boyd, R. L. F.; Seaton, M. J. and Massey, H. S. W. (*eds.*), **Rocket exploration of the upper atmosphere.** London, Pergamon, **1954.** p. 133–142. 9 figs., 7 refs., 14 eqs.) **DWB**—Between July 1950 and Nov. 1951 the Signal Corps Engineering Laboratories, White Sands Proving Grounds, N. Mex. (lat. 32°N) conducted a series of experiments on atmospheric temperature and wind measurements. A total of 32 values of temperature and wind velocity were obtained from 6 rocket flights. This communication contains a preliminary report on the instrumentation, methods of operation and a graphical presentation of the results as well as a discussion on the successes made. (*Same item as* 11I–38, Sept. 1960, *Met. Abs.*) *Subject Headings:* **1. Upper air temperature measurements 2. Upper air wind measurements 3. Rocket observations.**—*E.K.*

1955

12D-146 551.524.7:551.506.7:551.557(749)

Conover, W. C. and Wentzien, C. J., **Winds and temperatures to forty kilometers.** *Journal of Meteorology*, 12(2):160–164, April **1955.** 9 figs., 17 refs. **DWB**—Data from 145 balloon flights (88 above 30 km) at Belmar, N. J., are summarized. Graphs show the average seasonal temperatures and wind components up to 40 or 42 km and selected ascents. Temperatures are higher in summer than winter except about 12–16 km. Winds increase from W above 22 km in fall and winter; at other seasons they are light easterly. (*Same item as* 6.9–190, Sept. 1955, *Met. Abs.*) *Subject Headings:* **1. Upper air temperature data 2. Upper air wind data 3. Belmar, N. J.**—*C.E.P.B.*

12D-147 551.596.1:551.524.7:551.557(237.1)

Crary, A. P. and Bushnell, Vivian C., **Determination of high-altitude winds and temperatures in the Rocky Mountain area by acoustic soundings, October 1951.** *Journal of Meteorology*, 12(5): 463–471, Oct. **1955.** 6 figs., 4 tables, 8 refs. **DWB**—On each of 10 tests 3 4000-lb bombs were dropped 35 km apart by aircraft and recordings made at 4 listening posts. The winds and temperatures were calculated up to 50 km. At the temperature reversal near 50 km (−55°C at 30 km, 3–6°C at 45 km) light variable winds were found. Above 50 km wind and temperature effects could not be separated but an assumed temperature curve gave westerly winds up to 100 m/s at 70–80 km with shears up to 10 m/sec/km. (*Same item as* 7.3–301, March 1956, *Met. Abs.*) *Subject Headings:* **1. Upper air temperatures 2. Upper air winds 3. Acoustical sounding 4. Rocky Mountains.**—*C.E.P.B.*

12D-148 551.596.1:551.557(789)

Kennedy, William B.; Brogan, Lee and Sible, Norman J., **Further acoustical studies of atmospheric winds and temperatures at elevations of 30 to 60 kilometers.** *Journal of Meteorology*, 12(6):519–532, Dec. **1955.** 10 figs., 4 tables, 9 refs., 16 eqs. **DWB**—Results of firing 200 lb charges of TNT and recording elevation and azimuth of sound wave by an array of microphones are described. Operations in Colorado, Oct. 31, 1951–Aug. 28, 1952 confirmed the broad conclusions of the earlier Colorado series. These conducted in New Mexico bihourly from Oct. 20–24, 1952 (T Day) are fully treated. The winds and temperatures between 25 and 55 km are tabulated and plotted. The average wind was 23–39 m/s from 242–276°, but there were marked fluctuations over very short periods. Temperature increased as wind decreased with advancing time of day. (*Same item as* 7.5–261 and 11G–64, *Met. Abs.*) *Subject Headings:* **1. Acoustical upper wind measurement 2. New Mexico.**—*C.E.P.B.*

12D-149 551.524.7:523.74

*Lowenthal, M. J. and Newkirk, Gordon, Jr., **Temperature anomalies aloft and their correlation with solar activity, 1952-1954.** *U. S. Signal Corps Engineering Laboratories, Ft. Monmouth, N. J., Technical Memorandum,* No. 1692, Sept. 1, **1955.** 10 p. 7 figs., 9 tables, 6 refs. **DWB**—Data are presented for three periods covering high-altitude temperature rises observed at Belmar, N. J., up to 40 km during the winter 1953–54. The occurrence of a temperature rise appears to be related to the dynamics of the air at the high altitudes and to solar phenomena. An examination of solar activity data about the time of eight temperature-rise episodes suggests the following relations to solar phenomena: 1) absence of flares for the week preceding the peak temperature well beyond absences expected from chance and 2) undisturbed areas appearing on the solar meridian more frequently during the week preceding the peak temperature day. (*Same item as* 7.10–181, Oct. 1956, *Met. Abs.*) *Subject Headings:* **1. Upper air temperature anomalies 2. Solar activity.**—*Authors' abstract.*

12D–150 551.524.7(7, 988):551.508.822 551.557(7, 988):551.508.822

*Lowenthal, M. and Arnold, A., **Signal Corps-Air Weather Service high-altitude radiosonde flights, Aug. 1954.** *U. S. Signal Corps Engineering Labs., Ft. Monmouth, N. J., Technical Memorandum,* M-1711, Nov. 14, **1955.** 21 p. 12 figs., 5+6 tables, 9 refs. **DWB**—Upper air temperatures and winds for Belmar, N. J., Patrick Air Force Base, Fla. (28°14′N, 80°36′W), Goose Bay, Labrador (53°20′N, 60°25′W) and Narsarsuak, Greenland (61°11′N, 45°25′W) to 4 mb level (>120,000 ft) in Aug. 1954 are tabulated and presented graphically. Mean temperature, latitudinal variation, effect of tropopause, range of temperature, standard deviation, 24 and 48 hr temperature change, mean zonal winds, scalar winds, steadiness, s.d. of vector winds, etc. are considered. The observations were made with experimental high-altitude balloons with special radiosondes developed by the Signal Corps. A hypsometer was used for pressure, a motor for switching, and the balloons (6000 g) had a free lift from 1500 to 2500 g of He, and an ascension rate of 1000 ft/min. The mean cross section shows an easterly jet over Florida at 115,000 ft and a westerly jet at Belmar at 40,000 ft. Above 90,000 ft the minimum temperature at any level is independent of latitude, but the range of mean temperatures at any given level decreases to a minimum at 110,000 ft. (*Same item as* 8.4–25, April 1957, *Met. Abs.*) *Subject Headings:* **1. Upper air temperatures 2. Upper air winds 3. High altitude radiosonde flights 4. North America 5. Greenland.**—*M.R.*

12D–151 551.524.7:551.557:551.596.1(42)

Murgatroyd, R. J., **Wind and temperature to 50 km. over England. Anomalous sound propagation experiments, 1944–45.** *Great Britain. Meteorological Office, Geophysical Memoirs,* No 95, **1955.** 30 p. 11 figs., 7 tables, 16 refs., 44 eqs. **DWB**—The geometry of zones of audibility is set out. In 16 experiments explosions at 7–10 points in England were recorded on lattices of microphones. Audibility (up to 387 km) and time of travel are tabulated. The experiments gave, with certain assumptions, the vertical distribution of temperature and wind 18–50 km. Temperature at 50 km varied from 310°A in July and Aug. to 264°A in Jan. Wind at 30–45 km changed from westerly 40–80 m/s in winter to easterly <20 m/s in summer. Radiosonde measurements up to 18 km are given for comparison. (*Same item as* 7.11–205, and 10G–66, *Met. Abs.*) *Subject Headings:* **1. Acoustical soundings 2. Upper air temperatures 3. Upper air winds 4. England.**—*C.E.P.B.*

12D–152 551.510.3:551.510.53:551.501.81523.5(789)

†Opik, E. J., **Meteors and the upper atmosphere.** *Irish Astronomical Journal,* Armagh, 3(6): 165–181, June **1955.** 6 tables, 32 refs., 5 eqs. **DLC.** Reprinted as *Armagh, Ireland. Observatory, Leaflet,* No. 30. **DWB**—Up to 75 km the current meteor theory calculations of atmospheric density (Whipple 1943, 1949) check with rocket data obtained at White Sands, N. Mex.; above 75 km the calculated densities are about 90% too high (95 km, Whipple, 1952). Author shows that discrepancy in theory could be accounted for by assuming that only hard meteors reach levels <75 km whereas fluffy or spongy objects, which would crumble into thousands of pieces of dust, would be visible but never reach lower levels. The classical idea that spraying of hot liquid particles occurs from hard meteors would not be refuted by the above hypothesis, as it would deal with a special case. The pressure necessary to break up the "dustballs" would be about 10^4 dynes/cm^2. Ionization is discussed and tables presented for calculating ionizing efficiency of atomic collisions in air, decay of molecular ions in the ionized column of stony meteors through dissociative recombination, and selectivity of radar observations at 8.13 m for average dustball meteors. Radar observations are not considered to be statistically fit to deal with hyperbolic meteors or the general distribution of meteor velocities. (*Same item as* 7.11–148, Nov. 1956, *Met. Abs.*) *Subject Headings:* **1. Meteor ablation theory 2. Upper atmosphere densities from meteors 3. Radar meteor observation 4. White Sands, N. Mex.**—*M.R.*

12D-153 551.557:551.513

†Pant, P. S., **Circulation in the upper atmosphere.** N. Y. Univ. College of Engineering. Research Div., Contract AF 19(604)-1006, Scientific Report, No. 1, May **1955.** 43 p. 8 figs., 9 tables, refs., eqs. **DWB**—The winds in the region from 20 to 100 km over the Northern Hemisphere critically examined. The temperatures are computed from the wind field with the aid of rocket an pressure data and under the assumption that the wind field is geostrophic. The computed peratures are found to agree with direct observations. Tentative temperature cross sections the region from 20 to 90 km over the Northern Hemisphere for summer and winter are presented. the basis of the winds in the region from 20 to 100 km, and of theoretical considerations, the ulation in the mesosphere and thermosphere is derived. Though certain parts of the circulation posed here, especially above 100 km and at very high and very low latitudes, remain to be confied by direct observations of winds, the present model of circulation in the upper atmosphere pears to be satisfactory. Hydrodynamic instability is considered more likely in the thermosphere n at lower levels. (*Same item as* 7.3–212, March 1956, *Met. Abs.*) *Subject Headings:* **1. Upper circulation 2. Upper air winds 3. Northern Hemisphere.**—*From author's abstract.*

12D–154 551.524.7:551.510.534

Pressman, Jerome, **Seasonal and latitudinal temperature changes in the ozonosphere.** *Journal Meteorology*, 12(1):87–89, Feb. **1955.** 6 figs., table, 8 refs. **DWB**—Using assumed densities at 20 57.5 km and further assuming that energy absorbed by ozone went into heating, meridional cross tions 90°N-S of 24 hr temperature increment are given for 6 dates. They range up to 11°C at m over poles in summer. Below 20 km increment is negligible. (*Same item as* 6.5–165, and 7–41, *Met. Abs.*) *Subject Heading:* **1. Ozonosphere temperatures.**—*C.E.P.B.*

12D–155 551.510.534:551.524.73

Pressman, Jerome (*Geophysics Res. Directorate, A. F. Cambridge Res. Center*), **Diurnal temperature variations in the middle atmosphere.** *American Meteorological Society, Bulletin*, 36(5):220–223, y **1955.** 9 figs., 12 refs. **DWB**—A computation has been made of the seasonal and latitudinal iation of the diurnal temperature changes in the ozonosphere. There was assumed a uniform ling rate over a twenty-four hour period which exactly balanced the heating due to absorption ozone of solar energy. The computations indicate that the diurnal temperature variation curve elatively constant with latitude up to about 75°N latitude. The maximum diurnal temperature iation is at about 45 km. (*Same item as* 7.4–130, and 10F-40, *Met. Abs.*) *Subject Headings:* **Diurnal temperature variations 2. Ozonosphere temperatures.**—*Author's abstract.*

12D–156 551.596.1:551.507.362.1(789)

Stroud, W. G.; Terhune, E. A.; Venner, J. H.; Walsh, J. R. and Weiland, S. (*all, U. S. Signal ps Engineering Labs., Ft. Monmouth, N. J.*), **Instrumentation of the rocket-grenade experiment measuring atmospheric temperature and winds.** *Review of Scientific Instruments*, N. Y., 26(5): 7–432, May **1955.** 9 figs., table, 11 refs. **DLC**—Results of 92 grenade explosions from 15 Aerobee ket firings from March 3, 1950 to Sept. 4, 1953 at White Sands, N. Mex., are being analyzed with pect to efficiency of this method of determining upper air temperatures and winds. From 4 to 8 nades are exploded on each flight at specified heights (which can be determined to ±1 to 6 ft at ,000 ft by photographic methods). The formulas $C = kT^{\frac{1}{2}}$ and $V = C + W$ are used; where C = velocity of sound due to elasticity, k is a constant, T = absolute temperature, V = velocity of propagation ound wave, and W = wind velocity. Methods, rockets, rocket instrumentation, grenade structure, n detectors, telemetering system, safety features, sound ranging equipment, positions of grenade losions, ground temperatures and a summary of the 15 firings are included in text, and equipment some of the records are illustrated. The temperatures and wind can be determined for each cessive layer (between grenade firings). Timing to .1 millisecond is necessary. The sound ectors are arranged so they are nearly vertically beneath each grenade when it exploded. (*Same as* 7.4-102 and 11I-68, *Met. Abs.*) *Subject Headings:* **1. Rocket-grenade wind determination Rocket-grenade temperature determination 3. Acoustical soundings 4. Aerobee rocket firings ocket instrumentation 6. White Sands, N. Mex.**—*M.R.*

1956

12D–157 551.507.362.1:551.510.3:551.510.53:551.524.7(789)

Bartman, F. L.; Chaney, L. W.; Jones, L. M. and Liu, V. C. (*all, Engr. Res. Inst., Univ. of h., Ann Arbor*), **Upper air density and temperature by the falling sphere method.** *Journal of plied Physics*, 27(7):706–712, July **1956.** 6 figs., 2 tables, 7 refs., 22 eqs. **DLC**—Upper air sities are calculated from data obtained by measuring the trajectory of an inflatable nylon sphere in diameter ejected from a rocket at its maximum height. The sphere contains a DOVAP

(Doppler velocity and position) transponder and antenna. The drag equation is used to calculate the density from the sphere trajectory data. Then by rise of the hydrostatic equations and equations of state of a gas, the temperatures are obtained. The aerodynamics, instrumentation, calculations, errors due to winds, velocity, acceleration, drag coefficient, etc., are treated in detail. Results of 4 rocket ascents at White Sands during May 1952–Sept. 1953 (to 75 or 80 km) are analyzed and presented graphically. (*Same item as* 8.6-172, June 1957, *Met. Abs.*) *Subject Headings:* **1. Upper atmosphere density 2. Upper air temperatures 3. Falling sphere method 4. Rocket data 5. White Sands, N. Mex.**—*M.R.*

12D–158 551.510.42:551.593.55:551.524.7(94)

Bigg, E. K., **Detection of atmospheric dust and temperature inversions by twilight scattering.** *Nature, London,* 177(4498):77–79, Jan. 14, **1956.** 3 figs., 3 refs. **DWB**—Apparatus was set up at Alice Springs, Australia, for measuring dI/Idl (I = red and infrared twilight illumination) for different heights of the earth's shadow. There was a large maximum at 15 km (temperature inversion and dust boundary) and a smaller one near 80 km. This also coincides with a temperature inversion and is attributed to meteor dust, the maxima coinciding with meteor showers. (*Same item as* 7.5–103, May 1956, *Met. Abs.*) *Subject Headings:* **1. Dust layers 2. Twilight phenomena 3. Upper air temperatures 4. Alice Springs, Australia.**—*C.E.P.B.*

12D–159 551.524.7:551.507.362.1(789)

†Ference, M., Jr.; Stroud, W. G.; Walsh, J. R. et al., **Measurement of temperatures at elevations of 30 to 80 kilometers by the rocket-grenade experiment.** *Journal of Meteorology,* 13(1):5–12, Feb. **1956.** 7 figs., 2 tables, 41 refs., 6 eqs. **DWB**—Aerobee rockets ejected and exploded grenades at several predetermined intervals at White Sands, N. Mex.; explosions were photographed and arrival of sound waves at a microphone timed. The method of analysis, taking account of winds, is set out. Results of 6 ascents are given in a table and graphs. They showed no clear-cut diurnal or seasonal variation but some irregularities. Two firings overlapped balloon ascents and agreed with them. The maximum was about 266°K at 48 km. The probable error was 3%. (*Same item as* 7.8–165 and 11I–74, *Met. Abs.*) *Subject Headings:* **1. Upper air temperature data 2. Rocket grenade experiments 3. White Sands, N. Mex. I. Weisner, A. G.**—*C.E.P.B.*

12D–160 551.001:551.510.53:001.4

Flohn, Germann, **Bemerkung zur Frage der Nomenklatur der Atmosphäre.** [Problem of the nomenclature of the atmosphere.] *Germany. Deutscher Wetterdienst, Berichte,* 4(22):85–86, **1956.** 2 figs., 8 refs. **DWB, DLC**—The author criticizes the IGY classification of the atmosphere, which assumes the existence of a separation between the stratosphere and mesosphere after reviewing evidence showing that in most of the atmosphere there is no separation between stratosphere and mesosphere and that in middle latitude there is a gradual transition above 40 km, but no stratopause. The author proposes to extend the stratosphere up to the temperature maximum at about 40 km. (*Same item as* 8.10-46, Oct. 1957, *Met. Abs.*) *Subject Headings:* **1. Atmospheric nomenclature 2. Stratosphere 3. Mesosphere.**—*I.L.D.*

12D–161 551.501.7:551.510.3:551.510.53:551.508.762

Friedland, Stephen S.; Katzenstein, Jack and Zatzick, Michael R. (*all, Dept. of Physics, Univ. of Connecticut*), **Pulsed searchlighting the atmosphere.** *Journal of Geophysical Research,* Wash., D. C., 61(3):415–434, Sept. **1956.** 16 figs. (incl. photos), 9 refs., 6 eqs. **DLC**—An optical pulsed searchlight system has been developed for measuring the density profile of the upper atmosphere. A light source which emits a 50-megalumen pulse, 20 μsec in duration, is placed at the focal point of a 60-in. mirror. A photomultiplier, which is part of a logarithmic recording system covering a dynamic range of four orders of magnitude, is placed at the focal point of a similar mirror. Each time the light is pulsed, an entire density profile is obtained. An altitude above 40 km has been observed. Suggestions and methods for obtaining signals from higher altitudes are discussed. The data obtained to date agree with the results of previous investigators and theoretical calculations. (*Same item as* 8.5–142, May 1957, *Met. Abs.*) *Subject Headings:* **1. Searchlight techniques 2. Upper atmosphere density measurement 3. Searchlights.**—*Authors' abstract.*

12D–162 551.510.53:551.507.362.1:551.501.7

Groves, G. V., **Theory of the rocket-grenade method of determining upper-atmospheric properties by sound propagation.** *Journal of Atmospheric and Terrestrial Physics,* London, 8(4/5):189–203, May **1956.** fig., 7 refs., 61 eqs. **DWB**—The method of deducing the fields of wind, pressure, density and temperature by explosion of grenades ejected from a rocket at roughly equal space intervals, recorded by microphones at the ground (4 is the minimum) is discussed mathematically. A complete theory is formulated for analyzing the data by a successive approximation. It is assumed that the Mach number of the wavefront is a known function of time along any ray, decreasing from

about 2 at 100 km to unity with the expansion of the wavefront and increasing density. The order of accuracy of pressure determination at 90 km is about 3%. (*Same item as* 7.10–126, and 11I–77, *Met. Abst.*) *Subject Headings:* **1. Upper atmosphere research 2. Rocket observation techniques.** —*C.E.P.B.*

12D–163 551.510.3:551.524.7:551.507.362.1

Jones, L. M. and Bartman, F. L., **A simplified falling-sphere method for upper air density.** Michigan. Univ. Engineering Research Institute. Contract AF 19(604)-999. Technical Report [unnumbered], June **1956.** 89 p. 52 figs. (incl. photos), 4 tables, 16 refs., 56 eqs.—Design and construction details are presented extensively for the falling sphere, its instrumentation, launching and the results of 2 soundings, such as are contemplated for synoptic surveys, one on April 8, 1955, and one on June 24, 1955. Sphere ejection occurred at 174,000 ft and 182,000 ft, respectively, and rockets reached 356,000 and 320,000 ft. Soundings were made with a 2 stage (Nike-Deacon) rocket, at Wallops Island, Va. Calculations of the sphere trajectories (sphere altitude vs time, sphere altitude vs horizontal range and velocity component vs time) shown on graphs, indicate deviation of trajectory using measured drag accelerations from that using NACA estimate for nose cone trajectory and radar data. Air densities and temperatures are also worked out to 260,000 and 228,000 ft, respectively, and compared graphically with standard values. (*Same item as* 10.7–39, and 11I–80, *Met. Abs.*) *Subject Headings:* **1. Falling sphere soundings 2. Upper atmosphere density 3. Upper atmosphere 4. Nike-Deacon rocket soundings.**—*M.R.*

12D–164 551.501.7

Kellogg, William W., **Very high level observations.** (In: American Meteorological Society. District of Columbia Branch, **Proceedings of the Workshop on Stratospheric Analysis and Forecasting, Feb. 1–3, 1956.** pub. **1956.** p. 84–97. 5 figs.) **DWB**—A discussion of present knowledge of and future knowledge to be obtained in the region of the atmosphere between 30 and 100 km. The author considers the deductions about upper air temperature derived from the evidence of anomalous sound propagation and from the presence of noctilucent clouds; the characteristics of the NACA model atmosphere, the ionospheric circulation in higher levels and temperature change with height during summer and winter; and the energy source of the winter atmosphere above 60 km such as the ratio of ozone to water and the partial dissociation of oxygen above 90 km. The various indirect methods for studying the upper atmosphere are reviewed. These include the passive systems such as observation of meteors, total ozone in the vertical, observations on the effective radiation temperature of the ozone regime; effect of the atmosphere on the radio waves which come from "radio stars" and observations of airglows and auroras. The active systems for studying the upper atmosphere comprise the following: method of sound propagation, reflection or refraction of radio waves from the ionized layers of the atmosphere, scattering of radio waves and the use of the searchlight. *Subject Headings:* **1. Upper air observation techniques 2. NACA Standard Atmosphere 3. Upper air studies 4. Upper air temperatures.**—*I.L.D.*

12D–165 551.510.53:551.507.362.1 551.507.362.1:551.547

*LaGow, H. E. and Ainsworth, J. (*both, U. S. Naval Res. Lab., Wash., D. C.*), **Arctic upper-atmosphere pressure and density measurements with rockets.** *Journal of Geophysical Research*, Wash., D. C., 61(1):77–92, March **1956.** 13 figs., 2 tables, 19 refs., 4 eqs. **DLC**—Data were obtained from four balloon-launched Deacon rockets in N.E. Canada during the summers of 1953 and 1954, without the aid of ground-based trajectory measurements. The atmospheric density profile in the 25- to 45-km region was found within the experimental error to be the same as the Rocket Panel, White Sands values. The measured atmospheric pressure and the computed temperature for the flights at 62° and 74° north were found to be up to 30% higher in the 30- to 45-km region, but approximately equal to the White Sands values at 70 km. At 74°N, a high lapse-rate is indicated within the region 44 to 60 km. (*Same item as* 7.11–124, Nov. 1956, *Met. Abs.*) *Subject Headings:* **1. Rocket measurements 2. Upper air pressure 3. Upper atmosphere density 4. Arctic.** —*Authors' abstract.*

12D–166 551.524.7:551.510.53:551.508.762

Morozov, V. M., **Ob opredelenii izmenenii temperatury vozdukha v stratosfere v zavisimosti ot vremeni putem prozhektornogo zondirovaniia.** [The determination of atmospheric temperature variations in the stratosphere as a function of time by means of sounding with a searchlight.] *Akademiia Nauk SSSR, Izvestiia, Ser. Geofiz.*, No. 3:366–371, March **1956.** 10 refs., 6 eqs. **DLC**—In this critical review, the author analyzes the sources of error in the determination of stratospheric temperature changes with time. They are the result of incalculable variations in the penetrability of the atmosphere during the time of measurement. The searchlight technique is described and the role of atmospheric diffusion in the precision of the measurements of temperature changes is con-

sidered. (*Same item as* 9.3-194, March 1958, *Met. Abs.*) *Subject Headings:* **1. Stratospheric temperature variations 2. Searchlight techniques.**—*I.L.D.*

12D–167 551.510.53

Paetzold, Hans-Karl, **Das heutige Bild der Stratosphäre.** [The present picture of the stratosphere.] *Umschau*, 56(17):528–531, Sept. 1, **1956.** 5 figs. **DLC**—In this useful summary the characteristics of the stratosphere are set out and methods of investigation by sound waves, balloons and rockets described. Ozone and water vapor content to 30 km, temperature to 100 km and wind direction and speed to 70 km are plotted. (*Same item as* 8.1–178, Jan. 1957, *Met. Abs.*) *Subject Heading:* **1. Stratosphere.**—*C.E.P.B.*

12D–168 551.510.53

†Paetzold, Hans-Karl, **Die Meteorologie der Stratosphäre.** [Meteorology of the stratosphere.] *Germany. Deutscher Wetterdienst, Berichte*, 4(22):43–54, **1956.** 17 figs., 3 tables, 61 refs., eqs. **DWB, DLC.** English transl. by Rudolf Loeser and James Gouch, Jr. issued by the American Meteorological Society under Contract AF 19(604)-1936, June **1957.** 41 p. Includes tables and figs.—After briefly summarizing the uniform, specific meteorological characteristics of the stratosphere, the author presents a comprehensive discussion of methods of stratospheric investigation including abnormal sound propagation, meteor observations, search light rays, airplanes, balloons and rockets; the composition of the stratosphere including the distribution of the atmospheric gases in the stratosphere, of ozone and of water vapor; transport processes in the stratosphere as indicated by O_3 and H_2O traces; radiation balance; temperature distribution and variations up to 100 km altitude, irregular periodic oscillations of temperature, annual variation of temperature; stratospheric winds and solar influences upon weather. (*Same item as* 9.1–171, Jan. 1958, *Met. Abs.*) *Subject Headings:* **1. Stratospheric structure 2. Stratospheric temperatures 3. Stratospheric winds 4. Stratospheric research.**—*I.L.D.*

12D–169 551.501.71:531.52:551.510.3:551.510.53

Peterson, John W., **Analytical study of the falling-sphere experiment for upper-air-density measurement.** Michigan. Univ. Engineering Research Institute, Contract AF 19(604)-1871, Final Scientific Report, Nov. **1956.** 34 p. 15 figs., 16 refs., 94 eqs.—The falling-sphere method has proved to be a practical system for the measurement of air density in the upper atmosphere. This paper analyzes the physical characteristics of the system in order to establish the limits of its sensitivity. The possibility of approaching these theoretical limits in a practical system are discussed. Two new concepts are described which should greatly increase the sensitivity of the system. These concepts make possible a more favorable mass-to-area ratio and offer relief from the effects of spin. The present system has successfully measured air density of 4×10^{-8} slugs/ft^3, which is the density at about 50 miles. The measurement of an air density of 10^{-15} slugs/ft^3, which is estimated to be the density at an altitude of 300 miles, appears to be feasible by an extension of proved techniques. *Subject Headings:* **1. Falling sphere method 2. Upper atmosphere density measurement.**—*Author's abstract.*

12D–170 551.506.7:551.507.362.1:551.510.53

Stroud, W. G.; Nordberg, W. and Walsh, J. R. (*all, Signal Corps Engr. Labs., Fort Monmouth, N. J.*), **Atmospheric temperatures and winds between 30 and 80 km.** *Journal of Geophysical Research*, Wash., D. C., 61(1):45–56. March **1956.** 5 figs., 4 tables, 9 refs., 4 eqs. **DLC**—The method and analysis of the rocket-grenade experiment are briefly described. The 59 values of temperatures and of wind speeds and directions between 30 and 80 km obtained during 12 Aerobee rocket firings are summarized. The mean temperature distribution has a maximum of about 270°K at 50 km, with a lapse rate of about 2.5°/km above the peak. The winds are strong and from the west during the winter months (Oct. through Feb.); less strong and from the east during the summer months (April through Aug.); and are comparatively weak and predominantly from the north during the fall (Sept.). The maximum wind speed measured was a value of 104 m/sec at 55 km during a winter firing. The average probable error for the temperature data is ±5°C; the average errors in wind speed and direction are ±10 m/sec and ±18°, respectively. (*Same item as* 7.11–117 and 11I–86, *Met. Abs.*) *Subject Headings:* **1. Rocket grenade data 2. Upper atmosphere research.** —*Authors' abstract.*

1957

12D–171 551.507.362.1:551.506.7:621.396

Alekseev, P. P. et al., **Raketnye issledovaniia atmosfery.** [Rocket studies of the atmosphere.] *Meteorologiia i Gidrologiia*, Leningrad, 8:3–13, **1957.** 6 figs. (incl. photos and diagram), table, refs., 8 eqs. **DLC.** Transl. into English by M. I. Weinreich. Available Sandia Corporation, Albuquer-

ıe, N. Mexico. **DWB** (M10 A366ro)—The disposition of meteorological apparatus in the cone of a eteorological rocket, the type of apparatus, the electrical power, etc., are described in detail with .e aid of a diagram. The launching of the meteorological rocket and the communication system volved in the reception of signals from the rocket are discussed. Equations are presented showing:) the relationship between the fundamental parameters of the radio-telemetric line; (2) the relation- .ip between pressure within the manometer and pressure in the free atmosphere; and (3) the lationship between the temperature of the thermometer and the temperature of the ambient mosphere. The computation of the terms of the equations and their validity with reference to the)paratus employed are illustrated. A graph and table showing the distribution of pressure, tem- :rature and density with height as obtained from rocket measurements are presented. (*Same item* 10.6–87, June 1959, *Met. Abs.*) *Subject Headings:* **1. Rocket communication systems 2. Rocket easurements.**—*I.L.D.*

12D–172 551.507.362.1:551.501.7

Izakov, M. N. and Kokin, G. A., **Izmerenie temperatury, davleniia i plotnosti atmosfery s moshch'iu raket.** [Rocket measurements of atmospheric temperature, pressure and density.] *.S.S.R. Glavnoe Upravlenie Gidrometeorologicheskoĭ Sluzhby. Komitet po Provedeniiu Mezhduna- dnogo Geofizicheskogo Goda, Informatsionnyĭ Sbornik*, No. 4:57–61, **1957.** 3 figs. **DWB**—The entral Aerological Observatory developed a special meteorological rocket whose head is released at a ven altitude and comes down by parachute so that the instruments remain for a longer time in e strata being investigated. The rocket head contains thermal manometers measuring pressure thin a range of 10 to 5×10^{-3} mm Hg; membrane manometers measuring pressure from 760 mm 10 mm Hg, special resistance thermometers and bolometers. The recordings of the instruments e transmitted by radio. The head also contains a camera and the photographs obtained are used determine the position of the rocket in flight. Various theoretical and experimental problems sociated with the measurement of temperature, pressure and density were solved. These include e phenomena resulting from the movement of the instruments in rarefied gas, the inertia of the cording devices, the relationship of the thermal coefficient of restoration of the thermometers and anometers and the Mach and Reynolds numbers, the relationship of the manometer pressure and e Mach number, etc. The pressure and temperature are two interdependent variables since essure can be computed from temperature obtained by the given thermometers by means of the rometric formula and the equation of state, and temperature can be computed similarly from essure measured with a manometer. Graphs giving the distribution of temperature with height, essure with height, and density with height, according to data of the Central Aerological Ob- rvatory and U. S. data, are presented. (*Same item as* 10.10–156, Oct. 1959, *Met. Abs.*) *Subject eading:* **1. Rocket observation techniques.**—*I.L.D.*

12D–173 551.508.822:551.524.7(7,988) 551.508.822:551.557(7,988)

Lowenthal, Marvin J., **High-altitude radiosonde flights, July 1955, Pt. 3.** *U. S. Signal Corps ngineering Labs., Ft. Monmouth, N. J., Technical Memorandum*, No. M-1933, Dec. 10, **1957.** 77 p. figs. **DWB** (M07.812 U586s)—In order to get high altitude meteorological data of vital interest rocket designers and engineers, special experimental radiosonde balloons were used during July, 55, at 8 stations including 3 new stations: Long Beach, Calif., Portland, Ore., and Denver, Colo., d the stations previously (August, 1954; *see* 8.4–25, April 1957, *Met. Abs.*) used: Narsarsuak, Green- nd, Goose Bay, Labrador, Belmar, N. J., Patrick AFB, Fla. and Chanute AFB, Ill. Mean tem- rature data are tabulated for 1000, 700, 500, 400, 300, 250, 200, 150, 100, 80, 50, 40, 25, 20, 15, 10, 8, 7, 6, 5, 4, 3 and 2 mb (all stations reached 5 mb) and actual data for each level for each ascent esented *in extenso*. Graphs give standard deviations as well as values of temperature, zonal winds ong 120°W and 70°W, 24 hour temperature changes, mean winds, isotherms for North America at veral levels, etc. (*Same item as* 10.6–19, June 1959, *Met. Abs.*) *Subject Headings:* **1. High altitude diosonde flights 2. Upper air temperature data 3. Upper air wind data 4. North America Greenland.**—*M.R.*

12D–174 551.510.53

†Mikhnevich, V. V. and Khvostikov, I. A., **Izuchenie vysokikh sloev atmosfery.** [The study the upper layers of the atmosphere.] *Akademiia Nauk SSSR, Izvestiia, Ser. Geofiz.*, No. 11:1393–09, **1957.** 6 figs. (incl. photos, graphs), 5 tables, 78 refs. **DWB.** English transl. available m Special Libraries Association Translation Center (John Crerar Library, Chicago), as its R-3475. While this review is primarily devoted to the contributions of Soviet scientists to the investigations the upper atmosphere during the past 40 yrs, it is also a summary of the general progress in this d during the same period. The author discusses present knowledge of the structure and constitu- n of the atmosphere including temperature at altitudes up to 100 km, atmospheric tides, the use indirect and direct methods for studies of the upper atmosphere etc.; measurements of the char- eristics of the upper atmosphere by means of apparatus carried by rockets, including the con-

struction of meteorological rockets and of the instruments employed (illustrated by means of photographs and diagrams), and the results of rocket investigations. Data are presented on the composition of the atmosphere at high altitudes, atmospheric pressure as measured on the instrument container, mean weighted values of temperature, pressure and density according to measurements with manometers and thermometers in a meteorological rocket, atmospheric pressure and temperature as measured in containers and rockets (including the meteorological rocket), and atmospheric pressure according to investigations made in the U.S.S.R. and the U. S. Various theoretical Soviet studies on ozone in the stratosphere, distribution of dissociated oxygen in the ozonosphere, vertical mixing in the upper atmosphere, the nature of the green flash, twilight luminescence etc., are summarized briefly. (*Same item as* 10.3–195, March 1959, *Met. Abs.*) *Subject Headings:* **1. Upper atmosphere research 2. U.S.S.R.**—*I.L.D.*

12D–175 551.508.4:551.501.74:551.507.362.1

Mikhnevich, V. V., **Ismerenie davleniia v verkhneĭ atmosfere.** [Measurement of pressure in the upper atmosphere.] *Uspekhi Fizicheskikh Nauk*, Moscow, 63(1b):197–204, Sept. **1957.** 8 figs., 2 tables, 5 refs. **DLC.** Transl. into English in corresponding issue of *Soviet Physics USPEKHI*, New York.—The apparatus (using an unstabilized container) and results of pressure measurements at heights of 50–100 km are discussed. (*Same item as* 11I–108, Sept. 1960, *Met. Abs.*) *Subject Headings:* **1. Upper atmosphere pressure measurement 2. Rocket pressure instruments.**—*Physics Abstracts.*

12D–176 551.510.53:551.557:551.524.7

†Murgatroyd, R. J., **Winds and temperatures between 20 km and 100 km—a review.** *Royal Meteorological Society, Quarterly Journal*, 83(358):417–458, Oct. **1957.** 9 figs., 7 tables, bibliog. p. 454–458, 19 eqs. **DWB**—This useful summary attempts to synthesize all information on winds and temperature up to 100 km or more. Theoretical considerations are dealt with first—temperature distribution and its control by the radiation field in summer and winter, and other physical factors affecting winds, including friction, dynamics of the ionosphere, magneto-hydrodynamic forces and atmospheric tides. Then follows a summary of experimental methods and available measurements. Radiosondes and radar extend to 25–30 km, exceptionally 42 km. Near 30 km there is a change from westerly winds in winter to easterly in summer. N-S sections of observed temperatures and zonal winds, pole to pole, are shown. Drifts of sodium vapor have been measured to 110 km. Anomalous propagation of sounds of explosions gives winds up to 60 km. Rockets, rocket grenades and density measurements by searchlight scattering are next described. Visual, photographic and radio observations of meteors extend to above 100 km and results are summarized. Noctilucent clouds at 80 km generally agree with visual observations of meteors. A long section deals with radio propagation studies of fading records, which can be interpreted as winds up to 150 km. Finally determinations of composition, temperature and motion of the upper atmosphere from airglow and aurora are discussed. Results of temperature and zonal wind determinations are then collected together and vertical meridional sections drawn for summer and winter. Temperatures, heights of pressure contours and densities are proposed for a standard atmosphere, winter and summer. Finally, some remarks are made on coupling of stratosphere with troposphere and convection. (*Same item as* 9.2–27, Feb. 1958, *Met. Abs.*) *Subject Headings:* **1. Upper air temperatures 2. Upper air winds.** —*C.E.P.B.*

1958

12D–177 551.501.71:531.52:551.510.3:551.510.53:551.506.22

Jones, L. M.; Fishbach, F. F. and Peterson, J. W. (*all Univ. of Michigan*), **Seasonal and latitude variations in upper-air density.** (In: Hanessian, John, Jr. and Guttmacher, Ilene (*eds.*), **Experimental results of the U. S. Rocket Program for the International Geophysical Year to July 1, 1958. International Geophysical Year, 1957/1958.** *IGY World Data Center A* (*Rockets and Satellites*), *IGY Rocket Report Series*, No. 1. July 29, **1958.** p. 47–57. 9 figs., table, 11 refs., 2 eqs.) **DWB**—The falling-sphere method for upper air density has yielded results in 13 flights at various seasons and latitudes. The results at 33°N show little seasonal variation and are in good agreement with the ARDC 1956 atmosphere. A trend of decreasing density at 50 km with increasing latitude was measured. Later flights at 59°N showed that a variation as large as the one with increasing latitude could occur at a single latitude in a four day interval. (*Same item as* 11I–120, Sept. 1960, *Met. Abs.*) *Subject Headings:* **1. Upper atmosphere density variations 2. Falling-sphere method 3. International Geophysical Year 1957–1958.**—*E.K.*

12D–178 551.524.7(7.988):551.508.822 551.557(7,988):551.508.822

Lowenthal, Marvin and Arnold, A., **High altitude radiosonde flights, January 1955.** *U. S. Signal Research and Development Lab., Ft. Monmouth, N. J., USASRDL Technical Report*, 1962,

April 28, **1958.** 45 p. 8 tables, 14 refs., 25 figs. Reproduced from typescript. **DWB** (M(055) U582 us1962)—Upper air data to 100,000 ft from five locations: Patrick AFB, Fla.; Belmar, N. J.; Chanute AFB, Ill.; Goose Bay, Labrador; and Narsarsuak, Greenland, are analyzed for the month of Jan. 1955. An abrupt change in the stratospheric winds occurred near the middle of the month. The two wind regimes are analyzed and discussed. The synoptic situation leading to the monsoon change is described. Mean stratospheric temperatures and winds are shown and the seasonal differences discussed. Within the limits of the available data, diurnal variations in temperatures are described. Diurnal variation of the winds could not be ascertained at this time. (*Same item as* 10.8-247, Aug. 1959, *Met. Abs.*) *Subject Headings:* **1. High altitude radiosonde flights 2. Upper air winds 3. Upper air temperatures 4. North America 5. Greenland.**—*Authors' abstract.*

12D-179 551.510.535:546.17:546.21:535.215

*†Nicolet, M., **Aeronomic conditions in the mesosphere and lower thermosphere.** Pennsylvania. State Univ. Ionosphere Research Laboratory, Contract AF 19(604)-1304, Scientific Report No. 102, April 1, **1958.** 89 p. 12 figs., 9 tables, 67 refs., eqs. **DWB**—The mesosphere and the lower atmosphere lie between 50 and 100 km. A study of the aeronomy of the atmosphere is presented, together with an analysis of the pressure measurements below 100 km. The report includes: the dissociation of molecular oxygen, the characteristics of atomic nitrogen, oxygen, nitric oxide: their concentrations and absolute values. A description of "night airglow and the ionization of nitric oxides by cosmic rays, x-rays and by the Lyman-alpha" is given. The conclusion discusses reasons why a study of the thermosphere must consider a variable oxygen-nitrogen ratio and the problems associated with nitric oxide and atomic nitrogen as well as other physical processes of the mesosphere and the lower thermosphere. *Subject Headings:* **1. Mesosphere 2. Thermosphere 3. Upper air pressure measurements.**—*N.N.*

12D-180 551.507.362.1:551.596.1

Otterman, Joseph, **A simplified method for computing upper-atmosphere temperature and winds in the rocket-grenade experiment.** Michigan. University Engineering Institute, Dept. of Aeronautical Engineering, Contract DA-36-039-SC-64659, Project DA 3-17-02-001, Technical Report (unnumbered), June **1958.** 40 p. 7 figs., 6 tables, foot-refs., numerous eqs. **DWB** (M07.3620 089si)—A much simpler method than that which is used at the present for the calculation of temperatures and winds at high altitudes is presented. The data were obtained from the rocket-grenade experiment conducted by the Engineering Research Institute of the University of Michigan. Aspects of the subject covered are: method of the data reduction, calculation of the characteristic velocities from the times of arrival at the microphones, equations for meteorological parameters in a layer with a known sound-ray path, equations for tracing the sound-ray through a layer with known meteorological parameters, etc. The method is illustrated by applying it to the data from SM 1.01 and SM 1.02 rocket flights. (*Same item as* 10G-120, and 11I-130, *Met. Abst.*) *Subject Headings:* **1. Rocket-grenade temperature determination 2. Rocket-grenade wind determination 3. Acoustical soundings 4. Upper air soundings.**—*N.N.*

12D-181 551.547:551.507.362.1

Ripley, William S. **Comparison of Russian and American upper air data at rocket altitudes.** U. S. Air Force Cambridge Center, Jan. **1958.** 6 p. 3 figs., 2 tables, 8 refs. Typescript. **DWB** (M10.535 R592co)—Pressure data obtained by means of rockets over central European U.S.S.R. up to an altitude of 100 km are plotted against similar data obtained over the U. S. The two pressure vs. altitude curves cross at 80 km; above that altitude the Russian pressure values are lower and below that altitude higher than the American values. Insufficient number of measurements or geographical differences are suggested as probable causes of the discrepancies. (*Same item as* 10.2-239 and 11I-131, *Met. Abs.*). *Subject Headings:* **1. Rocket data comparisons 2. Pressure data discrepancies between American and Russian observations.**—*G.T.*

12D-182 551.524.7:551.510.53:551.507.362.1(985)

Shvidkovskiĭ, E. G., **Nekotorye rezul'taty izmerenii termodinamicheskikh parametrov stratosfery pri pomoshchi meteorologicheskikh raket.** [Some results of measurements of thermodynamic parameters of the stratosphere by meteorological rockets.] *Iskussivennye Sputniki Zemli*, Moscow, No. 2:10-16, **1958.** 4 figs., ref. **DLC.** Transl. into English in **Artificial Earth Satellites,** N. Y., Plenum Press, **1960.** Vol. 2:12-19. **DWB**—A brief description of the method of measuring temperature and pressure in the upper stratosphere by means of rockets is presented. This is followed by a preliminary discussion of the seasonal variations of the temperature field in the middle and lower stratosphere on the basis of data of rocket studies in the Arctic and middle latitudes of the U.S.S.R. The material included data up to 40-50 km. Graphs showing the vertical distribution of temperature for different months in 1957 and 1958 for Franz Josef Land, at middle latitudes, the annual variation of temperature in the stratosphere and the temperature field over Franz Josef according to given

rocket readings are included. The temperature of the lower stratosphere between 20–25 km on transition from summer to winter months. In the 40–50 km region this rule is disturbed maximum is situated at a higher level in the north than in middle latitude. An approxim isothermal layer extends into the polar region at a greater height from the troposphere than in m latitudes. The annual temperature variation of the stratosphere at middle latitudes shows a ma maximum during the summer period in the lower stratosphere. In this region (26–34 km) the an fluctuation is 13°C. In the 40–50 km region the fluctuation is 10°C. In the latter region the m mum temperature coincides with the summer solstice; in the former it is in July. (*Same ite* 11I–132, Sept. 1960, *Met. Abs.*) *Subject Headings:* **1. Upper stratosphere 2. Vertical tempera variations 3. Rocket soundings 4. Franz Josef Land.**—*I.L.D.*

12D–183 551.510.53:551.507.362.1(9

Spencer, N. W.; Boggess, R. L. and Taeusch, D. (*all University of Michigan*), **Pressure, tem ture and density to 90 km over Ft. Churchill.** (In:Hanessian, John, Jr. and Guttmacher, (*eds.*), **Experimental results of the U. S. Rocket Program for the International Geophysical Ye June 1, 1958. International Geophysical Year, 1957/1958.** *IGY World Data Center A* (*Rocket Satellites*), *IGY Rocket Report Series*, No. 1. July 29, **1958.** p. 80–90. 8 figs., 5 refs., 9 eqs.) **I** —The purpose of this paper is to describe experiments that have been carried out by Aerobee and Cajun rockets employing pressure as the basic data, and the results of some preliminary data re tion that has been accomplished. (*Same item as* 11I–120, Sept. 1960, *Met. Abs.*) *Subject Hea* **1. Upper atmosphere structure 2. Rocket observations 3. Ft. Churchill, Canada.**—*E.K.*

12D–184 551.510.53:551.507.362.1:551.506.22(9

Stroud, W. G.; Bandeen, W. R.; Nordberg, W.; Bartman, F. L.; Otterman, J. and Titu **Temperatures and winds in the Arctic as obtained by rocket grenade experiments.** (In: Hanes John, Jr. and Guttmacher, Ilene, (*eds.*), **Experimental results of the U. S. Rocket Program fo International Geophysical Year to June 1, 1958. International Geophysical Year, 1957/1958.** *World Data Center A* (*Rocket and Satellites*), *IGY Rocket Report Series*, No. 1. July 29, **1958.** p. 5 14 figs., (incl. photos) 2 tables, 10 refs., eq.) **DWB**—Ten successful Aerobee rockets carryin Signal Corps-University Michigan rocket grenades were fired at Ft. Churchill, 59°N as a part U. S. IGY program. One hundred and sixty-three values of temperatures and winds betwe and 94 km have been measured in summer and winter both in daytime and at night using th proved tracking and sound ranging techniques required to make the grenade experiment a weather experiment. Compared to the results of 12 firings at White Sands, the temperature winds are more sensitive to time variations, the temperatures are considerably lower at 80 km the winds show the same winter-from-west, summer-from-east pattern of the middle latit (*Same item as* 11I–120, Sept. 1960), *Met. Abs.*) *Subject Headings:* **1. Upper air temperature 2. Upper air wind data 3. Rocket grenade experiments 4. International Geophysical 1957–1958 5. Ft. Churchill, Canada.**—*E.K.*

12D–185 551.510.53:551.510.3

*U. S. Army Ballistic Missile Agency, Redstone Arsenal, Alabama, **Density distributions function of altitude for International Falls, Minnesota.** Its *Technical Report*, DA 16–58, Sep **1958.** (72) p. charts, 4 tables. **DWB** (M10.3 U582d)—During 1951–1954, the National We Records Center, Asheville, N. C. collected observational data on the density distributions of ai analyzed them as a function of altitude for International Falls, Minn. The results of the inve tion are presented in this paper statistically as well as graphically. The distribution of am absolute and relative densities of air is the main concern of this preliminary report. *Subject Hea* **1. Density gradients 2. Upper atmosphere density data 3. International Falls, Minn.**—*N.N.*

1959

12D–186 551.507.362.1:551.510.53(9

†Bandeen, W. R.; Griffith, R. M.; Nordberg, W. et al., **Measurement of temperatures, dens pressures and winds over Ft. Churchill, Canada, by means of the rocket grenade experiment.** *Signal Research and Development Laboratory, Ft. Monmouth, Technical Report*, 2076, Nov. 2, 71 p. 24 figs., tables, 13 refs., eqs. **DWB** (M(055) U585us)—Ten successful Aerobee rocket fi carrying the Signal Corps University of Michigan rocket grenade experiment, have been cond at Ft. Churchill, Manitoba, Canada (59°N) as part of the U. S. IGY program. One hundre fifty three values of temperatures and winds between 25 and 95 km have been measured in sur and winter, both during the day and at night, using the improved tracking and sound ranging niques required to make the grenade experiment an all weather experiment. Some striking facts about the Arctic upper atmosphere were revealed. Temperatures in winter are unexpec high above 60 km with a second temperature maximum occurring between 70 and 80 km. Sur

temperatures as low as 165°K at 80 km were recorded. The temperature maximum lies at about 50 km and in summer is greater than in White Sands, while in winter these temperatures are lower. Densities and pressures have also been calculated from these data. The winds show a pattern similar to that in the middle latitudes; strong and westerly in winter, weaker and easterly in summer. (*Same item as* 11I–143, Sept. 1960, *Met. Abs.*) *Subject Headings:* **1. Aerobee rocket firings 2. Upper atmosphere measurements 3. Ft. Churchill, Canada. I. Stroud, W. G.**—*Authors' abstract.* Ⓢ

12D–187 551.501.71:531.52:551.510.3

Burns, G. A.; Linder, W. J.; Schorsch, J. F. et al. (*all, Boeing Airplane Co., Seattle*), **Formation of a radio frequency plasma at an antenna during falling sphere measurements.** *Rand Corporation, Santa Monica, (Publication)*, R-339, **1959.** Paper No. 18 (25 p.). 12 figs. (incl. photos), 9 refs. **DWB** (M10.5 R186ae)—A seven-inch diameter sphere has been used extensively by University of Michigan personnel to measure air density up to 65 miles. The sphere is ejected from the nose of a Nike-Cajun rocket as it climbs past 35 miles and it continues up to over 100 miles. It telemeters to the ground its deceleration caused by the upper atmosphere as the sphere exits and then re-enters that atmosphere. The telemeter pulses are abnormally attenuated on the upward and downward passage in a region from 20 to 60 miles. Boeing experiments show that a radio frequency plasma occurs at the 400 megacycle slot antenna at pressures simulating these altitudes. However, the attenuation of pulses does not cause a loss of data in the present case. The effect would be important in specific vehicles. Electrons near the antenna acquire sufficient energy from the radio frequency power being radiated to ionize the low density gas. Breakdown occurs and a plasma forms when the production of new electrons by ionization is equal to loss by various mechanisms. The breakdown field necessary is lowest at the altitude (35 miles) where the frequency at which the excited electrons collide with ambient gas atoms is equal to the radio frequency. A survey of experimental data indicates that within engineering accuracy diffusion and/or attachment predominates as the loss mechanism and therefore scaling laws can be used. The breakdown field for the antenna in the sphere is non-uniform. The breakdown voltages are roughly half the breakdown voltages measured in uniform field cavities scaled to the appropriate gap length, pressure and frequency. This experience demonstrates that the breakdown characteristics of short gap or slot antenna at other frequencies can be predicted. *Subject Headings:* **1. Falling sphere method 2. Air density measurement techniques. I. Steele, H. L. II. Schulte, H. F.**—*Authors' abstract.* Ⓢ

12D–188 551.501.7:551.507.362.1:551.506.22

Jones, Leslie M. (*High altitude Res. Lab., Michigan Univ.*), **Measuring upper air structure.** *Astronautics*, N. Y., 4(7):28–29, 50, July **1959.** figs., port. (incl. vita). **DLC**—During IGY the U. S. sounding rockets carried new instruments to measure temperature, density and pressure in the upper atmosphere. The observations were made in the 30 to 90 km altitude range. The University of Michigan launched 31 rockets. An account is given of the experiments made by the Soviet Union in this field. The rocket effort during IGY yielded important results. *Subject Headings:* **1. Rocket exploration of the upper atmosphere 2. Upper atmosphere sounding methods 3. IGY rocket program.**—*A.H.K.* Ⓢ

12D–189 551.510.3:551.524.7:551.507.362.1(712.7)

Jones, L. M.; Peterson, J. W.; Schaefer, E. J. et al. (*all, Dept. of Aeronautical and Astronautical Eng., Univ. of Michigan*), **Upper-air density and temperature: some variations and an abrupt warming in the mesosphere.** *Journal of Geophysical Research*, Wash., D. C., 64(12):2331–2340, Dec. **1959.** 6 figs., 18 refs., 2 eqs. **DLC**—Measurements of upper air densities and temperatures from 12 flights of the rocket-borne falling sphere are presented. They show little seasonal variation at 32° and 38°N, but large variations in a few winter days at 59°N. A low Arctic density at 60 km results in a linear latitude density gradient of about 2 per cent per degree of latitude. Such a gradient was measured in a latitude survey. An abrupt warming at 45 km was detected at Fort Churchill in January 1958 and related to a warming of larger scope detected by balloons. The average air temperatures above Fort Churchill from January to March are warmer at 75 km and cooler from 50 to 30 km than at 32° to 38°N. (*Same item as* 11I–157, Sept. 1960, *Met. Abs.*) *Subject Headings:* **1. Upper atmosphere research 2. Falling sphere method 3. Rocket soundings 4. Ft. Churchill, Canada. I. Schulte, H. F.**—*Authors' abstract.* Ⓢ

12D–190 551.524.7:551.557:551.510.53(73)(988)

*Lowenthal, Marvin and Arnold, A., **High altitude radiosonde flights, 1956, Pt. 4.** *U. S. Signal Research and Development Lab., Ft. Monmouth, N. J., Technical Report*, 2018, March 15, **1959.** 178 p. 40 figs., 6 refs., mostly tables. **DWB** (M(055) U582us)—High altitude radiosonde flights made for or by the Signal Corps during Jan. and July 1956 at 8 stations in North America located along 2 longitudinal sections from the Arctic to the tropics (Ft. Greely, Alaska; Salem and Portland, Oreg.; Santa Monica, Calif; Narsarssuak, Greenland; Goose Bay, Labrador; Belmar, N. J.; Patrick A. F. B.,

Fla.) and 2 central U. S. stations (Chanute A. F. B., Ill. and Lowry A. F. B., Colo.) are analyzed and data presented in extenso and also in analytical and summarized form. These flights were begun in Aug. 1954. Mean temperature and standard deviation of temperature and mean winds are shown for each station for each month (Jan. and July), and mean cross sections along east and west coast, mean zonal winds and mean 20 mb maps for Jan. and July presented. The January map is not reliable for Canada and Alaska. During Jan. 1956 abnormally warm air was noted in the stratosphere in the middle Atlantic area and WNW to 60°N on the west coast. Stratospheric easterlies are stronger in the summer than are winter westerlies at the same height. (For Pt. 1, 2 and 3, *see* 8.4–25; 10.8–247 and 10.6–19, *Met. Abs.*) (*Same item as* 11.11–189, Nov. 1960, *Met. Abs.*) *Subject Headings:* **1. High level wind data 2. High level radiosonde data 3. Stratospheric temperatures 4. Stratospheric winds 5. Mean 20 mb charts 6. U. S. 7. Greenland.**—*M.R.*

12D–191 551.510.5:551.507.362.1(917.1)

Michigan. Univ. Engineering Research Institute, **Atmospheric phenomena at high altitudes.** Contract DA-36-039-sc-64659, Quarterly Reports, May 1, 1956–Jan. 31, **1959.** 11 pieces. Paging varies (18 to 61 p. each). numerous figs., tables. **DWB** (M10.5 M624ad)—The purposes of the Contract are: a) to adapt the rocket-grenade experiment for use in the Arctic during the International Geophysical Year; b) to participate in the preparation and firing of the IGY rocket-grenade experiments; c) to collect and analyze upper air samples; and d) to engage in general investigation of problems relating to upper air research. Theoretical studies have been carried out on the subjects of the explosion-produced modulation of DOVAP records, finite amplitude of propagation effects, the effect of variation in velocity of propagation of electromagnetic radiation on the DOVAP system, the possibility of measuring ambient pressure at very high altitudes, and the dynamics of rarified gases. A new system for measuring helium leakage in sampling bottles was devised and used successfully. Two papers on aerodynamic research by V. C. Liu were submitted for publication: **Theory of flight of the sounding rocket** (*J. App. Mech.*) and **On the drag of a sphere at extremely high speeds.** The results and observations of ten rocket-grenade experiments (Fort Churchill, Canada) were summarized. The new program for the Guam DOVAP and ballistic camera tracking system and the instrumentation required were presented. General investigation of the literature has been made in regard to basic topics of interest for future research. Collaboration between Chapman and V. C. Liu was initiated to treat the upper atmosphere separation problem. The quarterly report covering the period Nov. 1, 1958–Jan. 31, 1959 describes: the DOVAP tracking and telemetering and ballistic camera tracking operation carried out on Guam by the U. of Michigan for the U. S. Army Signal Research and Development Laboratory, the IGY Guam rocket programs, the application of LGP-30 computer to the geophysical research investigation. The status of the reduction of the Fort Churchill IGY data is given together with recommendations for completing the work. (*Same item as* 11I–168, Sept. 1960, *Met. Abs.*) *Subject Headings:* **1. Upper atmosphere research 2. IGY rocket program 3. Rocket observation techniques 4. Ft. Churchill, Canada. I. Allen, H. E. II. Bartman, F. L. III. Liu, V. C. IV. Otterman, J. V. Wilkie, W. J. VI. Wenzel, E. A.**—*E.K.* Ⓢ

12D–192 551.501.7:551.596.1:551.524.7

Mordukhovich, M. I., **Lokal'nyĭ akusticheskiĭ metod izmereniia temperatury vozdukha.** [Local acoustical method of measuring air temperatures.] *Akademiia Nauk SSSR, Izvestiia, Ser. Geofiz.*, No. 3:480–488, March **1959.** 7 figs., table, 8 refs., 12 eqs. **DLC**—The acoustical method for measuring atmospheric temperature eliminates radiational errors and reduces inertial errors. In the free atmosphere temperature can be measured from the velocity of sound by using the local method, i.e., by elevating simultaneously receivers and sources of sound which are at a small distance from each other. The local acoustical method can reveal the fine structure of the atmospheric temperature field, determine the daily temperature variation and the effect of the sun upon the temperature of the lower and middle stratosphere and establish the errors of other apparatus. Temperature is measured on the basis of velocity of sound by means of the phase method during continuous radiation of sound. The measurement of temperature is reduced to determining the time of passage, τ, by sound of the distance l between two points, $\tau = \frac{l}{C} = \frac{\sqrt{T_0}}{C_0}\frac{l}{\sqrt{T}}$ where C_0 = velocity of sound at the initial temperature T_0. The air temperature is determined from $\varphi = \frac{\omega l}{\sqrt{\gamma B/\mu}}$ where $\varphi = 2\pi f$. The acoustical thermometer without excluding wind effect, the acoustical thermometer with attenuation of the wind effect, and the sources and receivers of sound are described with the aid of diagrams. The equation for measuring temperature applicable to the acoustic thermometer with attenuation of wind effect is developed, and the results of measurements are presented. The possibility of measuring atmospheric temperature to heights of 40 km is indicated. (*Same item as* 11.11–280, Nov. 1960, *Met. Abs.*) *Subject Headings:* **1. Upper air temperature measurement techniques 2. Acoustical temperature determination.**—*I.L.D.* Ⓢ

12D–193 551.506.22:551.5:550.3:061.3(473)

Newell, Homer, E., Jr. and Townsend, J. W., Jr. (*both, U. S. Naval Research Lab.*), **IGY Conference in Moscow.** *Science*, N. Y., 129(3341):79–84, Jan. 9, 1959. 4 figs. (incl. photos), 2 tables, 15 refs. **DLC**—The Fifth General Assembly of CSAGI was held in Moscow from July 30 to Aug. 9, 1958. Among other things the Assembly decided that 1) IGY will terminate on Dec. 31, 1958; 2) IGY will be followed by "International Geophysical Cooperation (IGC), 1959," and 3) CASGI will cease to exist. It was also agreed that a complete record of IGY will be published in the form of **Annals** of IGY. During the symposia, which reviewed the accomplishments of IGY during its first year, the U.S.S.R. impressively reported its accomplishments in the rocket and satellite area. The Soviet experiments mainly concentrated on: a) Distribution of electron density and the nature and number of positive ions and b) Temperature distribution up to an altitude of 50 kms and the study of cosmic rays and photons. The article summarizes the techniques of Soviet experiments and outlines the results. Soviet and U. S. data is compared, summarized and graphically combined. (*Same item as* 11T–119, Oct. 1960, *Met. Abs.*) *Subject Headings:* **1. IGY conferences 2. Soviet participation in IGY 3. Moscow, U.S.S.R.**—*I.S.* Ⓢ

12D–194 551.506.22:551.510.3:551.507.362.1:531.52

Peterson, J. W.; Schulte, H. F. and Schaefer, E. J., **A simplified falling-sphere method for upper-air density, Pt. 2, Density and temperature results from eight flights.** Michigan. University. Research Institute, Contract AF 19(604)-999. Final Technical Report, May 1959. 30 p. 68 figs., 11 tables, 12 refs. **DWB** (M10.3 M6245).—The development and use of the small sphere method for synoptic measurement of upper air density and temperature is described. Density (and hence temperature) are calculated by means of the dray equation applied to a free falling sphere, which contains an omni-directional accelerometer. The report presents the modifications made in the electronics of the sphere-to-ground-station telemeter system which arose from the decision to use a pulseposition (time) code modulation for telemetering the accelerometer data. Ten flights of the new version of the small sphere experiment were carried out as part of the IGY or pre-IGY program of the U. S. The results from flights are tabulated. (*Same item as* 11I–172, Sept. 1960, *Met. Abs.*) *Subject Headings:* **1. IGY research 2. Upper atmosphere observation techniques 3. Rocket soundings 4. Falling sphere method.**—*E.K.*

12D–195 551.508.96:06.045

Raff, S. U.; Parker, M. J.; Snavely, B. L. et al., **Report on Phase I of the Feasibility Committee for 200,000 foot altitude instrumented HASP.** *U. S. Naval Ordnance Lab., White Oak, Md., NAVORD Report*, 6763, Dec. 15, 1959. 89 p. 33 figs., tables, 30 eqs., refs. **DWB**—There is very little atmospheric information available above 100,000 ft, and the requirements of Military and other programs which will use such information are not defined in such a way as to justify firm accuracy goals. It is recommended that a transponding sonde (x-band or 403 megacycle) be developed and that the final selection of sensors for a mass produced sonde be preceded by flight tests to evaluate the most promising sensors. For initial flights the Committee recommends a bead thermistor for temperature sensing and a single point pressure indicator to operate at 50,000 to 80,000 ft. A number of suggestions are made for other types of temperature and pressure sensors which might be developed for later models. The Committee sees a need for further effort on: (a) descent devices; (b) the ROBIN balloon device, which might fulfill the HASP requirement without the use of electronics, and (c) the HASP wind tunnel. It is felt that firing of the telemetering only (non-transponding) rounds designed for lower altitudes will yield information useful to the present HASP objectives. The Committee also believes that the HASP program would benefit from association with a modest program of upper atmosphere research. (*Same item as* 11.10–247, Nov. 1960, *Met. Abs.*) *Subject Headings:* **1. Radiosonde development 2. Upper atmosphere instruments.**—*Authors' abstract.*

12D–196 551.501.724:551.524.7:551.596.1(793)(968.1)

Reed, Jack W., **Summary of acoustic temperature and wind observations from atomic tests.** (In: Conference on Stratospheric Meteorology, Minneapolis, Aug. 31–Sept. 3, 1959, **Papers of the Conference,** (preconference summaries). 5 p. 6 figs., 11 refs.) **DWB** (M10.73 C748pa)—Sound patterns around atomic blasts in Nevada and the Marshall Islands have been analyzed to give winds and temperatures in the warm layer from 100,000 to 160,000 ft. Since sound has been recorded upwind from nearly every large shot, it follows that temperatures at these levels must be higher than at ground level. This is in disagreement with results of rocket sounding temperatures which generally show maximum temperatures below freezing at 150,000 ft. However, an assumption of considerably higher temperatures below 500,000 ft is necessary to obtain densities calculated from satellite orbits. *Subject Headings:* **1. Acoustical sounding data 2. Upper air temperature calculations 3. Nevada 4. Marshall Islands.**—*Author's abstract.* Ⓢ

12D–197 551.

Scherhag, Richard, **Uber die Luftdruck-, Temperature und Windschwankungen in der S sphäre.** [Air pressure, temperature and wind variations in the stratosphere.] *Akademie der W schaften und der Literatur, Mainz. Mathematisch-Naturwissenschaftliche Klasse, Abhandlunge* 15, **1959.** 95 p. 59 figs., 11 tables, 27 refs. **DLC** (6149.M22)—Studies of air pressure, tempe and wind variations in the stratosphere since 1952 are reviewed. The warming similar t which occurred over Berlin in Jan. and Feb. 1952 recurred in Jan. 1958 and was also observed in America. Charts and descriptions explain the stratospheric weather in winter 1958 and the wa from July 1958. The periodic variations in the stratosphere over Berlin in the summer of 19 reported. Weather charts of the Northern Hemisphere on special days beginning Jan. 3, 1958 various altitudes are included. *Subject Headings:* **1. Stratospheric winds 2. Stratospheric ten ture 3. Stratospheric pressure.**—*E.Z.S.* Ⓢ

12D–198 551.507.362.1:551.51

Stroud, W. G.; Nordberg, W.; Bandeen, W. R. et al. (*all: U. S. Army Sig. R & D Lab., Ft. mouth, N. J.*), **Rocket-grenade observation of atmospheric heating in the Arctic.** *Journal o physical Research*, Wash., D. C., 64(9):1342–1343, Sept. **1959.** fig., 3 refs. **DLC**—Ten A Rockets were fired to altitudes up to 100 km. The plotted data shows an average lapse r −1°C per km. Extremely low temperatures were measured at 80 km during the summer m These are in contrast to the relatively high temperatures observed during the winter months. plosive warmings result from the wintertime "breakdown of essentially zonal flow into larg meridional flow." The entire atmosphere up to 75 km becomes involved in this change in th pattern. (*Same item as* 11I-180, Sept. 1960, *Met. Abs.*). *Subject Headings:* **1. Atmos thermodynamics 2. Arctic research 3. Aerobee rocket firings 4. Arctic. I. Bartman, II. Titus, P.**—*E.Z.S.* Ⓢ

12D–199 10.534:551.5

†Viebrock, Herbert, **Diurnal temperature variation in the mesosphere.** N. Y., June **1959.** 15 figs., 2 tables, 41 refs., eqs. Thesis (M. Sc.). New York Univ. College of Engineering. stat of typescript. **DWB** (M10.534 V656di)—The new ozone absorption coefficients, deter experimentally by E. Vilroux in 1953, were used to study the absorption of solar energy a diurnal temperature variations in the region from 30 to 80 km. The vertical ozone distributi this region was computed from photochemical equilibrium theory with the Vigroux coeffi An adjusted absorption per unit volume per ozone density (E_z/n_3) versus total path lengt diagram was also prepared on the basis of the new coefficients. Computations were made for su and winter at three latitudes: 0°, 30°N, and 60°N. The maximum heating rate was found 1.3°C/hr at noon at 48 km during the summer at the equator. A range of 6.3°C calculated for during the summer at the equator was the maximum diurnal temperature variation. (*Sam as* 11.10–269, Nov. 1960, *Met. Abs.*) *Subject Heading:* **1. Ozonosphere heating.**—*Author's abst*

1960

12D–200 551.506.7:551.557:551.524.7:551.507.362

Bowen, P.; Boyd, R. L. F.; Groves, G. V. et al., **Wind and temperature results obtai Skylark experiments, by members of Dept. of Physics, Univ. College, Dept. of Met., Im College (both London) and Dept. of Applied Math., Queen's Univ., Belfast, Ireland.** *Interna Space Symposium, Nice, Jan.* **1960,** *Space Research: proceedings of the First Symposium.* Pub. p. 144–153. 10 figs., 2 refs., eq. French and Russian summaries p. 144. **DWB** (523.1 16 The results are presented of the first two grenade-window experiments carried out at the Wo Range, Australia, on Nov. 13th, 1957 and April 17th, 1958; and also of the first sodium exper carried out on Dec. 3, 1958. Winds in the middle stratosphere were from the east in the Nov firing and from the west and stronger in the April firing. The maximum temperature occur 50 km altitude and was slightly less in the April firing. A grenade explosion at 130 km result conspicuously glowing cloud, 2 km in diameter, which persisted for several minutes. In the s experiment, wind speeds were determined from 95 to 120 km altitude. *Subject Headings:* **1. R grenade experiments 2. Upper air wind data 3. Upper air temperature data 4. Woo Australia.**—*Authors' abstract.* Ⓢ

12D–201 551.510.3:551.510

Cole, A. E.; Darling, E. M., Jr. et al., **Atmospheric density.** (In: **Handbook of geophys Air Force designers,** ed. by C. F. Campen, Jr. et al., ed. Wash., D. C., **1960.** Ch. 4. (10 p.) 4 tables, 9 refs.). **DLC** (TL556.U615)—Information in the chapter include: (1) variation in a

pheric density between air masses and combinations of air masses for various seasons and locations in North America, (2) average and standard deviation of density at specific levels over North America, and (3) sample density soundings to high altitudes. Observed density data are compared with ARDC model atmosphere between 100,000 and 300,000 ft. These data give a fair idea of the order of magnitude of the variability of density at the individual levels. *Subject Headings:* **1. Upper atmosphere densities 2. Upper atmosphere models 3. North America.**—*E.K.* Ⓢ

12D–202 551.524.7

Hame, T. G.; Peake, W. H. et al., **Preliminary analysis of methods for temperature determination at altitudes above 120,000 feet.** Ohio State Univ. Research Foundation, Contract DA 36-039-Sc-84516, Report 973-2, May 25, **1960.** 49 p. 10 refs. Unchecked.—An analysis is given of the feasibility of a variety of methods for temperature determination at altitudes above 120,000 ft. It is concluded that several of these methods (e.g., rocket-greanade, falling sphere, pressure instrumentation) are developed to the point where they can yield accuracies of $\pm 5°K$ with an altitude resolution that is typically of the order of 1 km, at altitudes up to about 275,000 ft. Between this altitude and about 400,000 ft, present methods (mostly) based on pressure measurements) are not satisfactory. Above 400,000 ft proposed methods based on determination of kinetic temperatures in the ionosphere are discussed, but these methods are fully verified experimentally. *Subject Headings:* **1. Upper atmosphere temperature measurement techniques. I. Ohio. State Univ. Research Foundation II. Contract DA 36-039-Sc-84516.**—*Authors' abstract.* Ⓢ

12D–203 551.509.3:551.507.362.1(794)

Masterson, John E.; Hubert, William E. and Carr, Thomas R., **Temperature and wind data measured by meteorological rockets at Point Mugu, California.** Abstract of paper presented at International Symposium on Rockets and Astronautics, 2nd Tokyo, Japan, May **1960,** Orig. unchecked.—Meteorologists are on the threshold of obtaining, on a synoptic seasonal basis, wind and temperature data at altitudes between 30 and 60 kilometers. The launching of meteorological rockets from a number of stations are providing, for the first time, synoptic data from the mesosphere (20 to 60 km). Information concerning the firing of the LOKI and ARCAS meteorological rockets from one of these stations, Point Mugu, Calif., is presented. The techniques of handling and launching are discussed. Wind data from radar trackings of chaff and parachutes are presented. The data from parachute borne temperature sensors as telemetered with standard meteorological receiving equipment are also discussed. (*Same item as* 11I–191, Sept. 1960, *Met. Abs.*) *Subject Headings:* **1. Synoptic data 2. Mesosphere 3. Rocket soundings 4. LOKI rockets 5. ARCAS rockets 5. Point Mugu, Calif.**—*Authors' abstract.* Ⓢ

120–204 551.596.1:551.507.362.1

†Michigan. Univ. Engineering Research Institute. **Atmospheric phenomena at high altitudes.** Contract DA 36-039-Sc-64659, Final Report. April 14, 1955–January 31, 1960, Pub. April **1960.** 7 p. 30 refs. **DWB** (M10.5 M624ad). A general survey of the contract requirements concerning upper air wind and temperature measurements with rocket-grenades in the Arctic regions at altitudes between 30 and 90 km. The report includes the various supplementary tasks which were added to the contract from time to time. The reports which describe in detail each major task are also listed. (*Same item as* 11I–192, Sept. 1960, *Met. Abs.*) *Subject Headings:* **1. Rocket-grenade wind determination 2. Rocket-grenade temperature determination 3. Upper atmosphere research. I. Bartman, F. L. II. Jones, L. M.**—*E.K.*

12D–205 551.507.362.1:551.510.536:551.524.7

Ogden, D. E. and Swinton, D. B. (*both, Pacific Missile Range, Point Mugu, Calif.*), **ARCAS temperature data in the mesosphere.** *Monthly Weather Review,* Wash., D. C., 88(5):191–192, May **1960.** 2 figs., table, 4 refs. **DWB, DLC**—The purpose of this paper is to report the preliminary results depicting some of the direct measurements made by sounding rockets at Point Mugu, Calif. The data show good correlation with theoretical standards and high level balloon soundings. *Subject Headings:* **1. Upper air temperature data 2. Mesosphere 3. Rocket observations 4. Point Mugu, Calif.**—*Authors' abstract.* Ⓢ

12D–206 551.507.362.1:551.506.7(917.1)

Stroud, W. G.; Nordberg, W.; Bandeen, W. R. et al., **Rocket grenade measurements of temperatures and winds in the mesosphere over Churchill, Canada.** *Journal of Geophysical Research,* Wash., D. C., 65(8):2307–2323, Aug. **1960.** 14 figs., table, 23 refs., 7 eqs. **DLC.** Condensed version in: *IGY Bulletin,* Number 40:1–6, October **1960.** 3 figs. Also in: *Institute of the Aeronautical Sciences, N. Y., IAS Paper,* No. 60–47, **1960.** 30 p. 14 figs., table, 22 refs. **DWB** (M:629.13 159 pa). Also in: International Space Science Symposium, Nice, Jan. 1960, *Space Research:*

proceedings of the First Symposium. Pub. **1960.** p. 117–143. 12 figs., table, 21 refs., 7 eqs. Russian summary p. 117. **DWB** (523.1 161sp)—The firing of ten Aerobee rockets, each carrying 18 to 19 high-explosive grenades at Ft. Churchill, Canada, resulted in the accurate measurement of temperatures and winds in the atmosphere up to 95 km, during November, 1956, July, August, and December, 1957, and January, 1958. The total number of temp. and wind measurements is 150 for each of the two parameters over the period. Each measurement represents an average temperature and wind of an atmospheric layer of about 3 km thickness. The results show clearly a seasonal variation with average summer temperatures of 275°K and 170°K at altitudes of about 50 and 80 km respectively; corresponding average winter temperatures are 260°K and 230°K. In summer prevailing winds were from the east, usually less than 50 per sec. In winter these winds were from the west, usually between 50 and 100 m per sec, but in many instances exceeding 100 m per sec. A breakdown in circulation up to 80 km is indicated by the results of two firings on Jan. 27, 1958 where strong northerly-southerly wind components were measured. This phenomenon coincides with the occurrence of sharp temperature increases at stratosphere levels over large parts of the northern hemisphere east of Churchill. Remarkable temp. inversions between 50 and 80 km were measured in all winter firings. These inversions resulted in second temp. peaks above 50 km. On Dec. 11, 1957, the temp. at 70 km was about 270°K. In summer, temperatures at 50 km and below at Churchill (59°N were higher than at White Sands (33°N); above 60 km the Churchill temps. were lower. This picture is exactly reversed in winter. Only minor diurnal temp variations were detected. The experiments also indicated that no sound energy from detonations of 4-pound high explosive charges above 95 km can be detected on the ground with microphones of 1-dyne-per-square-centimeter sensitivity in the frequency range 8-to-25 cycles per second. (*Same item as* 11I–198, Sept. 1960, *Met. Abs.*) *Subject Headings:* **1. Rocket-grenade experiments 2. Mesospheric temperatures 3. Mesospheric winds 4. Ft. Churchill, Canada. I. Bartman, F. L. II. Titus, P.**—*Authors abstract.* Ⓢ

12D–207 551.510.53:551.507.362.1

Sutton, Sir Oliver Graham, **High atmosphere research in the Meteorological Office.** *Meteorological Magazine*, London, 89(1053):97–98, April **1960. DWB, DLC**—During the last few years, due to the development of rockets, upper limit of altitude of atmospheric research has risen. More and more attention has been paid to rockets. The decision to regard 100 kilometers as the top of meteorologists' atmosphere, does not mean that it is the limit of meteorology. In mid-latitudes there is little change in mean temperature from the tropopause to about 20 kilometers but temperature increases to a maximum of about 20°C at 50 km. Efforts are being made to study earth's atmosphere up to 100 km. The rockets will play an important role in this research. (*Same item as* 11I–197, Sept. 1960, *Met. Abs.*) *Subject Headings:* **1. Rocket exploration of the upper atmosphere 2. Temperature variations.**—*A.H.K.* Ⓢ

12D–208 551.506.22:551.510.534:551.510.41:546.264

Vassy, Arlette, **L'étude de l'ozone atmosphérique pendant l'Année Géophysique Internationale.** [The study of atmospheric ozone during the IGY.] *La Nature*, Paris, No. 3299:101–105, March **1960.** 7 figs. **DLC**—The International Ozone Commission within the I.U.G.G. gathers data together on atmospheric ozone from various parts of the globe. In order to obtain a world-wide insight into the question, the IGY has intensified the international cooperation. From July 1, 1957 to Dec. 31, 1958, 90 stations belonging to 27 countries have contributed to the IGY program which involved daily measurements of the reduced thickness, the concentration at ground level and the vertical distribution of atmospheric ozone. France had 8 stations, three of which were situated in the Antarctic. The principal characteristics of atmospheric ozone, its optical properties, its geophysical role, the main observational methods, and the various measuring instruments are successively examined. In meteorology the study of ozone is of great interest. It enables conclusions to be drawn concerning temperature and pressure of the upper atmosphere; it indicates the existence of a warm layer at about 50 km; it makes possible the tracing of large atmospheric motions, polar air outbreaks, intertropical front displacement, etc. The raw data collected during the IGV are brought together in a World Center charged with analyzing and publishing them. Among the first results of the IGY it is noteworthy to point out the anomalies observed in the Antarctic. The reduced thickness presents an important maximum at the end of November, i.e., one month before the summer solstice. Surface measurements show a maximum in the height of summer, with a secondary maximum in June, in the depth of winter. At slightly lower latitudes, a strong maximum appears from September to December. As concerns the vertical distribution, the direct measurements prove that the standard distribution pattern (with a maximum at about 20 and 30 km) is observed in only one half of the cases. Two pronounced maximums are often observed, the secondary maximum being situated in the troposphere below 18 km. (*Same item as* 11.9–195, Sept. 1960, *Met. Abs.*) *Subject Headings:* **1. Ozone layer 2. Vertical ozone distribution 3. Upper air temperature-ozone relationships 4. Ozone near the ground 5. IGY ozone program.**—*A.V.* Ⓢ

1961

12D–209 551.510.53:551.506.7:551.557:551.507.362.1(712.7)

†Ainsworth, J. E.; Fox, D. F. and LaGow, H. E. (*all, Goddard Space Flight Center*) **Measurement of upper-atmosphere structure by means of pitot-static tube.** *U. S. National Aeronautics and Space Administration, Technical Note,* D-670, Feb. **1961.** 47 p. 21 figs., 4 tables, 31 refs., 23 eqs. **DLC, DWB**—Profiles of atmospheric pressure, density, and temperature for the region 20 to 110 km above Fort Churchill, Canada, were computed from the data obtained during a single fall-day flight. The temperature profile had a major maximum at 58 km, a secondary maximum at 82 km, and several minor maximums in the region from 20 to 55 km. During the same flight a horizontal-wind profile was obtained in the region from 80 to 115 km. The average wind speed was 125 m/sec, and the maximum was 250 m/sec at 118 km. The instrumentation, method of measurement, and results are discussed in detail. Methods are prescribed for using the pitot-static tube for accurate synoptic measurements of atmospheric structure from 20 to 80 km and for measuring possible semidiurnal variations in the same region. *Subject Headings:* **1. Upper air temperature measurement techniques 2. Upper air wind measurement techniques 3. Rocket data 4. Ft. Churchill, Canada.**—*E.K.* Ⓢ

12D–210 551.506.7:551.507.362.2

Wark, D. Q. (*U. S. W. B., Wash., D. C.*), **On indirect temperature soundings of the stratosphere from satellites.** *Journal of Geophysical Research,* Wash., D. C., 66(1):77–82, Jan. **1961.** 4 figs., table, 15 refs., 20 eqs. **DLC**—Outgoing radiation from the atmosphere is calculated at several frequencies in the 15-μ carbon dioxide band according to the random Elsasser band model and the Curtis-Godson approximation to the mean line width. From the resulting values, an inversion of the problem is performed, with simplifying assumptions, to recover the temperature structure of the upper part of the atmosphere. This abbreviation of the experiment proposed by Kaplan would yield the temperatures and the lapse rates in two layers of the atmosphere from three measurements of the outgoing radiation. Results from three model atmospheres indicate that calculated mean lapse rates and mean temperatures in the two layers, as they might be deduced from measurements made from a satellite, are in good agreement with actual temperature structures. *Subject Headings:* **1. Atmospheric radiation measurements 2. Vertical temperature gradient 3. Mean temperature calculations 4. Satellite uses.**—*Author's abstract.* Ⓢ

PART III. TRANSLATIONS AND ANALYTICS FROM SERIALS AND COLLECTED WORKS

Note: Material listed in these sections will not be included in the monthly indexes until abstracted. The item number is mentioned for those titles which have been abstracted in previous issues of **Meteorological and Geoastrophysical Abstracts.**

A. TRANSLATIONS

Akademiia Nauk SSSR, Bulletin (of the) Academy of Sciences, USSR, Geophysics Series, No. 9, September 1959 (Transl. of their **Izvestiia, Ser. Geofizich.**, No. 9, Sept. 1959, issued July 1960 by American Geophysical Union)

Podbiapolskiĭ, G. S.: **The propagation of elastic waves in layered media, Pt. 2,** p. 913–919

Bernshteĭn, V. A.: **The stress at the boundary between the mantle and the earth's crust generated by convection in the mantle,** p. 920–928

Tel'e, E. and Tel'e, O.: **The intensity of the earth's magnetic field in the historical and geological past,** p. 929–949

D'iakonov, B. P.: **The diffraction of electromagnetic waves by a circular cylinder in a homogeneous half-space,** p. 950–955

Malakhov, S. G.: **The vertical distribution of radioactive emanations in the atmosphere,** p. 956–961

Kogan, R. M. and Nazarov, T. M.: **The accuracy of measurements of non-stationary fields of radioactive emissions,** p. 962–965

Bagariatskiĭ, B. A.: **On the problem of an effective recombination coefficient in the ionosphere,** p. 966–968

Savarenskiĭ, E. F. and Ragimov, Sh. S.: **On the determination of the average thickness of the earth's crust from Rayleigh wave group velocity measurements,** p. 969–971

Vasil'ev, Iu. I.: **A comparison of the reflection and refraction coefficients of elastic waves at the boundary of two solid and two liquid media,** p. 972–974

Kogan, S. Ia.: **Determination of energy of seismic body-waves,** p. 975–976

Solov'ev, S. L. and Sheĭn, V. B.: **The intensity of earthquakes according to data of the Far-Eastern and Continental stations of the USSR,** p. 977–985

Tskhakaia, A. D. and Maĭsuradze, O. M.: **The Achigvara earthquake of July 5, 1958,** p. 986–990

Tikhonov, A. N. and Dmitriev, V. I.: **The influence of interference in the induction method of electrical prospecting from the air,** p. 991–992

Barsukov, O. M.: **Some features of the variations in a 5–20 minute period telluric current,** p. 993–996

Klushin, I. G.: **Study of the distribution of sources of gravitational and magnetic anomalies by depth,** p. 997–1002

Kazinskiĭ, V. A.: **The application of a formula of Ostrogradsky to the approximate determination of the mass of a body,** p. 1003–1004

Zharkov, V. N.: **Thermodynamics of the earth's mantle,** p. 1005–1009

Slobodov, B. Ia.: **On the computation of baroclinity in the theory of centers of atmospheric action,** p. 1010–1011

Belekhova, N. G.: **On the influence of parameters of the free-molecular flow of rarefied gas on the instrument readings during the rocket measurements of density of the higher layers of the atmosphere,** p. 1012–1016

Klinov, F. Ia.: **On the supercooled water in the atmosphere,** p. 1017–1019

Ryzhkov, Iu. G.: **The calculation of the development of the subsidence phenomenon in the deep sea,** p. 1020–1021

Solov'ev, S. L.: **Session of the Council on Seismology,** p. 1022–1023

Kastrov, V. G. and Feĭgel'son, E. M.: **Conference on actinometry and atmospheric optics,** p. 1023–1024

emiia Nauk SSSR, Bulletin [of the] Academy of Sciences, USSR, Geophysics Series, No. 3, Mar. 1960 (issued Nov. 1960 by American Geophysical Union)

zovskiĭ, M. V.; Krestnikov, V. N.; Nersesov, I. L. and Reĭsner, G. I.: **New principles in establishing seismic regions, based on an example from central Tien-Shan, Pt. 2,** p. 235–245
ogan, S. D.: **Travel times of longitudinal and transverse waves, calculated from data on nuclear explosions made in the region of the Marshall Islands,** p. 246–253
lei, Shi-yun: **The seismic activity of China,** p. 254–264
orokhtin, O. G.; Krondrat'ev, O. K. and Avsiuk, Iu. N.: **Methods and principal results of seismic and gravimetric studies of the structure of the eastern Antarctica,** p. 265–268
iustikh, E. N.: **The energy consumed in the formation of the Earth's crust,** p. 269–273
conov, N. N.: **The Khait earthquake of 1949 and the geological conditions of its origination,** p. 274–283
Kitaĭgorodskiĭ, S. A.: **On the computation of the thickness of the wind-mixing layer in the ocean,** p. 284–287
bukhov, A. M.: **The statistically orthogonal expansion of empirical functions,** p. 288–291
Malkevich, M. S.: **The influence of non-orthotropicity of the underlying surface on the scattering of light in the atmosphere,** p. 292–296
Muliarchik, T. M.: **Interferometer measurement of the temperature of the upper atmosphere by the width of certain emission lines,** p. 297–302
Komarov, N. N.: **Some results of a study of unstable currents in ion counters,** p. 303–307
Karmaleeva, R. M.: **An attempt to forecast the time of near earthquakes,** p. 308–312
Glivenko, E. V.: **Determination of a refracting boundary from azimuthal station data,** p. 313–316
Tremd, V. M.: **A detector unit incorporating a photoresistance for use in seismic stations,** p. 317–318
Pudovkin, M. I.: **Sources of bay-shaped disturbances,** p. 319–323
Brodskaia, S. Iu. and Grabovskiĭ, M. A.: **One of the causes of non-coincidence of vector of rock residue magnetization with direction of magnetizing field,** p. 324–327
Tikitina, V. N.: **The calculation of a variable electromagnetic field over a sloping vein,** p. 328–334
Avaste, O. A. and Atroshenko, V. S.: **On the accuracy of V. V. Sobolev's method,** p. 335–336
Shuĭskaia, F. K.: **On auroral spectra,** p. 337–339

t Astronomy AJ, New York, Vol. 4, No. 2, Sept./Oct. 1960 (Transl. of original Russian journal **Astronomicheskiĭ Zhurnal,** Moscow, Vol. 37, No. 2, March/April 1960. For listing of original Russian titles, *see* Pt. III, Vol. 12, No. 1, *Met. Abstracts*)

mbartsumian, V. A. and Saakian, G. S.: **Degenerate superdense gas of elementary particles,** p. 187–201
Mustel', E. R.: **The total energy of corpuscular streams,** p. 202–211
l', A. I.: **The possible periodicity of solar activity,** p. 212–216
nevishev, M. N.: **The relationship between optical and radio-frequency emissions of the solar corona,** p. 217–224
Mogilevskiĭ, E. I., Nikol'skiĭ, G. M. and Nikol'skaia, K. I.: **The polarization of coronal emission lines,** p. 225–233
ordon, I. M.: **Supernova outbursts and the origin of cosmic rays,** p. 234–242
hklovskiĭ, I. S.: **Secular variation of the flux and intensity of radio emission from discrete sources,** p. 243–249
Moroz, V. I.: **The radiation flux from the Crab nebula at $\lambda 2\mu$ and some conclusions on the spectrum and magnetic field,** p. 250–257
khsanov, R. N.: **Nebulae 1318a, 1318b, 1318c, and interstellar absorption,** p. 258–263
Kaplan, S. A. and Klimishin, I. A.: **Some notes on the emission of light by shock waves under cosmic conditions,** p. 264–266
kripkin, V. A.: **Relativistic corrections in the problem of a point explosion in an ideal gravitating continuous medium,** p. 267–278
Kuz'min, A. D. and Salomonovich, A. E.: **Radio emissions from Venus in the 8 mm bandwidth,** p. 279–282
arabashov, N. P. and Koval', I. K.: **Results of studies of contrast on Mars,** p. 283–287
obrov, M. S.: **Theoretical phase curves of the shadow effect on Saturn's rings, Pt. 1, Derivation of pertinent formulas,** p. 288–297
gekian, T. A.: **General features of the evolution of rotating systems of gravitating bodies,** p. 298–307
irillova, T. S.: **A statistical analysis of the color-magnitude diagram of the open cluster IC 1805,** p. 308–312

Barkhatova, K. A. and Driakhlushina, L. I.: **The open cluster NGC 1513,** p. 313–316
Panaiotov, L. A.: **The compensation of refraction effects with the aid of a vacuum pris** p. 317–321
Razmadze, N. A.: **A superdense planetary nebula,** p. 322–323
Shatsova, R. B.: **The dispersion in the logarithms of the tangential velocities of stars in t lower part of the spectrum-luminosity diagram,** p. 324–327
Slonim, Iu. M.: **The intense chromospheric flares of July 10 and 14, 1959,** p. 327–329
Kliakotko, M. A.: **The latitudinal motions of nonrecurrent sunspots in different years members of a single aggregate,** p. 330–332
Popova, M. D.: **The curvature of the paths of some meteors during their motion through t earth's atmosphere,** p. 332–334
Fialko, E. I.: **The velocity distribution of meteoroids,** p. 334–336
Vorontsov-Vel'iaminov, B. A.: **Colloquium on galactic and extragalactic astronomy a electronic photography,** p. 337–340
Gorbatskiĭ, V. G.: **The first plenum of the commission on the physics of stars and nebula** p. 340–342
Grebenikov, E. A.: **Conference on problems in the mathematical theory of the motion of artific celestial bodies,** p. 343–351

Soviet Geography: Review and Translation (Issued by American Geographical Society N. Y. (Mostly translations from **Akademiia Nauk SSSR, Izvestiia, Ser. Geografich Geograficheskoe Obshchestvo, Leningrad, Izvestiia** and **Voprosy, Geografii,** Moscow Vol. 1, No. 1/2, Jan./Feb. 1960

Gerasimov, I. P.: **Present status and aims of Soviet geography,** p. 3–16 (Transl. of origin Russian in *Akademiia Nauk SSSR, Izvestiia, Ser. Geograf.*, No. 3:12–24, 1955)
Kravchenko, D. V.: **Work of the Institute of Geography of the Academy of Sciences of the USS in 1957,** p. 16–21 (Transl. of original Russian in *ANSSSR, Izvestiia, Ser. Geog.*, No. 3:14 150, 1958)
Murzaev, E. M.: **Results and aims of physical regional geography in the USSR,** p. 21– (Transl. of original Russian in *ANSSSR, Izv., Ser. Geog.*, No. 5:50–55, 1957)
Zekkel', Ia. D.: **On the courses of development and the next tasks of geomorphology,** p. 28– (Transl. of original Russian in *Vsesoiuznoe Geograficheskoe Obshchestvo, Leningrad, Izvesti* No. 6:534–536, 1958)
Parmuzin, Iu. P.: **The zonal character of the cold pole,** p. 40–42 (Transl. of original Russian *Vses. Geog. Obshch., Izvestiia,* No. 5:472–474, 1958)
Sokolov, A. V.: **The map of the forests of the USSR,** p. 68–71 (Transl. of original Russian *ANSSSR, Izv., Ser. Geog.*, No. 3:144–145, 1958)

B. ARTICLES APPEARING IN RECENTLY ISSUED PUBLICATIONS

Akademiia Nauk SSSR, Izvestiia, Ser. Geofiz, No. 12, Dec. 1960

Riznichenko, Iu. V. and Shamina, O. G.: **O mnogokratnykh otrazhennykh i prokhodiashchi volnakh,** [Multiple reflected and penetrating waves], p. 1689–1706
Gol'tsman, F. M.: **Ob eksperimental'nom analize pomekh i nadezhnosti rezul'tatov gru pirovaniia signalov,** [Experimental analysis of disturbances and reliability of the resu of signal classification], p. 1707–1716
Gol'tsman, F. M.: **Statisticheskaia otsenka nadezhnosti rezul'tatov gruppirovaniia signalo** [Statistical evaluation of the reliability of the results of signal classification], p. 1717–17
Timoshin, Iu. V.: **K teorii gruppirovaniia,** [The theory of classification], p. 1728–1739
Pasechnik, I. P.: **K opredeleniiu parametrov zatukhaniia voln P_n i S,** [Determination of p rameters of attenuation of Pn and S waves], p. 1740–1743
Belotelov, V. L. and Kondorskaia, N. V.: **K voprosu o vychislenii ĕnergii zemletriasen** [Calculation of the energy of earthquakes], p. 1744–1755
Baiuk, E. I.: **Izuchenie uprugikh svoĭstv obraztsov gornykh porod iz glubokoĭ skvazhiny vysokikh davleniiakh,** [Study of the elastic properties of rock samples from deep we under high pressure], p. 1756–1761
Konstantinova, A. G.: **Iskazheniia pri registratsii uprugikh impul'sov v gornykh vyrabotkal** [Distortions during recording of elastic impulses in open pit mining], p. 1762–1770

Shaub, Iu. B.: **Ob interpretatsii rezul'tatov izmereniĭ ugla naklona ploskosti poliarizatsii estestvennogo peremennogo magnitnogo polia,** [Interpretation of data from measurements of the angle of inclination of the polarization plane of a natural variable magnetic field], p. 1771–1777

Bulakh, E. G.: **Primenenie elektronnykh vychislitel'nykh mashin dlia interpretatsii gravitatsionnykh i magnitnykh anomaliĭ,** [Use of electronic computers for the interpretation of gravitational and magnetic anomalies], p. 1778–1781

Liuke, E. I.: **Ob eksperimental'noĭ zavisimosti energii seĭsmicheskikh voln ot usloviĭ vzryva,** [Experimental relationship between the energy of seismic waves and explosion conditions], p. 1782–1790

Gliuzman, A. M.: **Pole tochechnogo istochnika toka, raspolozhennogo na granitse poluprostranstva, v prisutstvii paraboloidal'noĭ poverkhnosti razdela,** [Field of a point source of a current located on the border of a half-space in the presence of a paraboloidal boundary surface], p. 1791–1795

Kudriavtsev, V. A. and Melamed, V. G.: **Chislennyĭ podschet teplooborotov v sredakh s fazovymi perekhodami kak kriteriĭ opredeleniia temperaturnoĭ sdvizhki,** [Numerical computation of heat exchanges in media with phase transitions as a criterion for the determination of temperature shifts], p. 1796–1800

Cheremenskiĭ, G. A.: **O vremeni vosstanovleniia termicheskogo rezhima, narushennogo bureniem skvazhiny,** [Restoration rate of the thermal regime disrupted by well drilling], p. 1801–1805

Liubimova, E. A.; Liusova, L. N.; Firsov, F. V.; Starikova, G. N. and Shushpanov, A. P.: **Opredelenie poverkhnostnogo teplovogo potoka v Staroĭ Matseste,** [Determination of the surface heat flow in Staraya Matsesta], p. 1806–1811

Gutshabash, S. D.: **Rasseianie sveta v atmosfere, primykaiushcheĭ k zerkal'no otrazhaiushcheĭ poverkhnosti,** [Light scattering in an atmosphere adjoining a mirror-like reflecting surface], p. 1812–1820

Teĭlor, R. Dzh.: **Vid profilia vetra v prizemnom sloe atmosfery,** [Wind profile in the atmospheric layer near the ground], p. 1821–1827

Smirnov, I. P.: **Opyt sostavleniia dolgosrochnykh prognozov srednikh mesiachnykh i dekadnykh anomaliĭ temperatury dlia severnogo polusharia Zemli,** [Preparing long range forecasts for mean monthly and decadal temperature anomalies for the Northern Hemisphere], p. 1828–1846

Dzhordzhio, N. V.: **Poliarizatsiia nekotorykh emissiĭ poliarnykh siianiĭ,** [Polarization of some auroral emissions], p. 1847–1851

Barteneva, O. D.: **Indikatrisy rasseianiia sveta v prizemnom sloe atmosfery,** [Light scattering coefficients in the atmospheric layer near the ground], p. 1852–1865

Ruzin, M. I.: **Vertikal'nye dvizheniia vozdukha v oblasti frontov,** [Vertical air motions within fronts], p. 1866–1870

Birfel'd, Ia. G.: **Radiolokatsiia poliarnykh siianiĭ,** [Radar observation of auroras], p. 1871–1882

Kazanskiĭ, A. B.: **Teplovoĭ balans otkrytoĭ poverkhnosti l'da lednika Fedchenko,** [Heat balance of the open surface of the ice of Fedchenko Glacier], p. 1883–1886

Soderzhanie zhurnala "Izvestiia AN SSSR, Seriia Geofizicheskaia" za 1960 g., [Contents of the periodical "Izvestiia ANSSSR, Seriia Geofizicheskaia" for 1960], p. 1887–1895

American Geophysical Union, Transactions, Vol. 41, No. 4, Dec. 1960.

International Union of Geodesy and Geophysics: **Reports on the 12th General Assembly, Helsinki, July 25–Aug. 6, 1960** (based on material prepared by various members of the National Academy of Sciences—AGU delegation, supplemented by unedited drafts of IUGG and Association documents. Not to be considered an official IUGG account), p. 541–658

Stroud, W. G.; Nordberg, W.; Bandeen, W. R.; Bartman, F. L. and Titus, P.: **Rocket-grenade measurements of temperatures and winds in the Arctic mesosphere,** p. 685–690

U. S. National Bureau of Standards: **Unusual solar-terrestrial event,** p. 690–692

Southworth, Mason P.: **Nighttime radio propagation in equatorial regions: first results of the IGY amateur radio research program,** p. 693–698

International rocket intervals, p. 698–700

Worzel, J. L.: **Gravity measurements on a surface ship at sea,** p. 701–706

Doumani, George A.: **Geological observations in West Antarctica during recent oversnow traverses,** p. 706–710

U. S. National Aeronautics and Space Administration: **The NERV experiment,** p. 710–713

World Warning Agency Report Jan. 1–June 30, 1960, p. 714–716

IGY bibliographic notes (bibliographic references relating to IGY and IGC-1959 programs and findings were selected from a bibliography under preparation in the Science and Technology Div. of the Library of Congress), p. 716
Chubb, T. A.; Friedman, H.; Kreplin, R. W. et al.: **Solar radiation satellite,** p. 717–721
International Geophysical Calendar for 1961, p. 722–726
Bourdeau, R. E.: **Ionosphere direct measurement satellite,** p. 726–729
"Planet Earth" film series, p. 730–732

American Meteorological Society, Bulletin, Vol. 42, No. 1, Jan. 1961

Changnon, Stanley A., Jr.: **Precipitation contrasts between the Chicago urban area and an offshore station in southern Lake Michigan,** p. 1–10
Baynton, H. W.: **Rocketsonde temperature profiles over White Sands, New Mexico,** p. 11–16
Howell, Wallace E.: **A simple infra-red absorption meter for gauging precipitable water vapor,** p. 17–19
Hage, K. D.: **On summer cyclogenesis on the lee of the Rocky Mountains,** p. 20–33
Baynton, H. W.: **AN/AMQ-15 rocketsonde tests at White Sands Proving Ground,** p. 34–41
Fritschen, Leo J. and Shaw, R. H.: **A thermocouple-type anemometer and its use,** p. 42–46
Joint meeting of California branches held at the U. S. Naval Postgraduate School, Monterey, California, Oct. 14–15, 1960, p. 48
Tasker Instruments Corporation, p. 54–56

Annales d'Astrophysique, Paris, Vol. 23, No. 5, Sept./Oct. 1960

Petit, Michel: **Le type de population des Céphéides galactiques; critères de distinction des types et catalogue,** [The type of galactic Cepheids population; criteria of type classification and catalog], p. 681–709
Petit, Michel: **La répartition galactique des Céphéides,** [Galactic distribution of Cepheids], p. 710–743
Petrie, R. M.: **Probable errors of stellar radial velocities and the frequency of variable velocities,** p. 744–748
Pottasch, Stuart R.: **Comments on some physical processes in diffuse nebulae,** p. 749–763
Pecker, Charlotte: **Etude des spectres pris par Bernard Lyot à l'éclipse de Khartoum du 28 février 1952,** [Study of the spectra obtained by Bernard Lyot of the Khartoum eclipse (February 28, 1952)], p. 764–787
Mianes, P.; Grudzińska, S. and Stawikowski, A.: **Observations physiques de la comète périodique Giacobini-Zinner (1959b),** [Physical observations of the periodic comet Giacobini-Zinner (1959b)], p. 788–796
Grudzińska, S.: **L'abondance des ions CO+ dans les queues cométaires,** [Abundance of CO+ ions in tails of comets], p. 797–801
Rudkjøbing, Mogens: **On the possible existence of a polarisation effect connected with the center limb effect in the solar spectrum,** p. 802–803

Astrophysical Journal, Chicago, Vol. 132, No. 3, Nov. 1960

Spiegel, Edward A.: **The convective instability of a radiating fluid layer,** p. 716–728
Ueno, Sueo: **The probabilistic method for problems of radiative transfer, Pt. 10, Diffuse reflection and transmission in a finite inhomogeneous atmosphere,** p. 729–745
Malitson, H. H.; Purcell, J. D.; Tousey, R. and Moore, C. E.: **The solar spectrum from 2635 to 2085 A,** p. 746–766
Jefferies, J. T. and White, O. R.: **Source function in a non-equilibrium atmosphere, Pt. 6, The frequency dependence of the source function for resonance lines,** p. 767–774
Jefferies, J. T.: **Source function in a non-equilibrium atmosphere, Pt. 7, The interlocking problem,** p. 775–789
Pagel, B. E. J.: **The influence of the chromosphere on solar limb darkening,** p. 790–800
Hinteregger, H. E.: **Interplanetary ionization by solar extreme ultraviolet radiation,** p. 801–811
Ney, E. P.; Huch, W. F.; Maas, R. W. and Thorness, R. B.: **Eclipse polarimeter,** p. 812–820
Parker, E. N.: **The hydrodynamic theory of solar corpuscular radiation and stellar winds,** p. 821–866
Liller, William: **The nature of the grains in the tails of comets 1956h and 1957d,** p. 867–882
Griem, Hans R.: **Stark broadening of higher hydrogen and hydrogen-like lines by electrons and ions,** p. 883–893
Wallace, L.: **The constants of the $^2\Pi$-$^2\Pi$ OH bands,** p. 894–897

Beiträge zur Geophysik, Leipzig, Vol. 69, No. 5, 1960

Verö, Josef: **Die Bestimmung der tellurischen Stationsellipsen,** [Determination of telluric station ellipse], p. 257–268

Teupser, Christian: **Zur Abstimmung und Eichung von elektrodynamischen Verrückungsmessern,** [Adjustment and calibration of electrodynamic displacement meters], p. 269–289

Ertel, Hans: **Teorema sobre invariantes sustanciales de la hidrodinâmica,** [Theorem on substantial invariants of hydrodynamics], p. 290–293

Kühlmann, Dietrich H. H.: **Zur Frage der räumlichen und zeitlichen Verteilung von Sauerstoff und anderen chemischen Faktoren in kleinen Gewässern,** [Problem of the spatial and temporal distribution of oxygen and other chemical factors in small bodies of water], p. 294–319

Canadian Journal of Physics, Ottawa, Vol. 39, No. 2, Feb. 1961

Rose, D. C. and Lapointe, S. M.: **Asymmetry in the recovery from a very deep Forbush-type decrease in cosmic-ray intensity,** p. 239–251

Bhattacharyya, B. K.: **Dipole-field type magnetic disturbances and auroral activities,** p. 350–366

Dal'nevostochnyĭ Nauchno-Issledovatel'skiĭ Gidrometeorologicheskiĭ Institut, Trudy, No. 10, 1960

Leskova, E. A.: **Ekstremal'no teplye i ekstremal'no kholodnye sinopticheskie sezony zimy v Vostochnoĭ Azii,** [Extremely warm and extremely cold synoptic seasons in winter in eastern Asia], p. 3–37

Barabashkina, A. P.: **Teplye i kholodnye sezony leta v Primor'e i na Sakhaline,** [Warm and cold seasons in summer in the Maritime Territory and in Sakhalin], p. 38–67

Agarkova, A. P.: **Vykhod iuzhnykh tsiklonov k raĭonam Kamchatki v kholodnoe vremia goda,** [Incursion of southern cyclones to Kamchatka regions during the cold season], p. 68–92

Novskaia, A. I.: **Kharakteristika mesiachnykh anomaliĭ temperatury vozdukha po Sakhalinu, Kamchatke, severo-zapadnomu i severnomu poberezh'iam Okhotskogo moria,** [Characteristic of monthly air temperature anomalies in Sakhalin, Kamchatka, the northwestern and the northern coast of the Okhotsk Sea], p. 93–101

Aksarina, E. A.: **Tipy baricheskikh poleĭ nad Tatarskim prolivom v ianvare-aprele,** [Types of pressure fields over the Gulf of Tatary in January–April], p. 102–112

Dziuba, V. K.: **Polozhenia planetarnoĭ vysotnoĭ frontal'noĭ zony v techenie zimnikh sinopticheskikh periodov nad Vostochnoĭ Azieĭ,** [Situation of the planetary upper frontal zone over eastern Asia during winter synoptic periods], p. 113–116

No. 11, 1960

Il'inskiĭ, O. K.: **Letniaia dal'nevostochnaia depressiia,** [Far Eastern summer depression], p. 3–53

Trostnikov, M. V.: **Sinopticheskie usloviia vynosa mass morskogo vozdukha zimoĭ na iug Dal'nego Vostoka,** [Synoptic conditions for the transport of sea air to the southern Far East during winter], p. 54–84

Mishnina, G. A.: **Potepleniia i snegopady v zimniĭ period na territorii Iakutskoĭ ASSR pri vostochnom protsesse,** [Warming and snowfall in the Yakut A.S.S.R. during the "eastern process" in winter], p. 85–99

Egorova, M. V.: **O rezhime meteleĭ na zheleznykh dorogakh Primor'ia,** [Regime of snowstorms along railroads of the Maritime Territory], p. 100–114

Arkhangel'skiĭ, V. L.: **Chechevitseobraznye oblaka v Primorskom krae,** [Lenticular clouds in the Maritime Territory], p. 115–117

Arkhangel'skiĭ, V. L.: **O raschete vertikal'nykh gradientov osadkov v raĭone Sikhote-Alinia,** [Computation of vertical precipitation gradients in the Sikhote Alin' region], p. 118–129

Vas'kovskiĭ, M. G.: **Tipizatsiia rek Kamchatki i nekotorye voprosy izucheniia ikh stoka,** [Types of rivers of Kamchatka and some problems in the study of their runoff], p. 130–157

Geofisica e Meteorologia, Genoa, Vol. 8, No. 5/6, Sept./Dec. 1960

Martel, L.: **Procédé pratique de détermination de l'amplification d'un séismographe électromagnétique,** [Practical method for determining the amplification of an electromagnetic seismograph], p. 97–105

Depietri, Carlo: **Sulla variazione secolare del campo magnetico terrestre nella regione dell'emisfero boreale compresa tra 350° ed 80° di longitudine Est,** [Secular variation of the terrestrial magnetic field in the Northern Hemisphere between 350° and 80°E longitude], p. 106–110

Sesto Congresso Internazionale di Meteorologia Alpina, Bled, Jugoslavia: 14–16 Settembre 1960, [6th International Congress of Alpine Meteorology, Bled, Yugoslavia, Sept. 14–16 1960], p. 110

Steinhauser, Ferdinand: **Sulle oscillazioni climatiche in Europa,** [Climatic oscillations in Europe], p. 111–122

Fritsch, Volker: **Indagini geoelettriche sulle frane,** [Geoelectric methods for precipices], p. 123–125

Indici K del carattere geomagnetico triorario: Settembre-Dicembre 1960 dedotti dalle registrazioni dell'Osservatorio di Monte Capellino (Genova), [K index of the three-hour geomagnetic characters, Sept.–Dec. 1960, at the Monte Capellino Observatory, Genoa], p. 126

Schultz, Nicolas: **I globuli bianchi e le macchie solari,** [Leucocytes and sunspots], p. 127–128

Mosetti, Ferruccio: **Considerazioni sulle applicazioni geofisiche dell'analisi periodale,** [Consideration of the geophysical applications of periodical analysis], p. 129–141

Bossolasco, Mario and Dagnino, Ignazio: **Ricerche di fisica marina; Parte Quarta, Le maree meteorologiche a Genova,** [Research in physical oceanography, Pt. 4, Meteorological tides at Genoa], p. 142–155

Geofisica Pura e Applicata, Milan, Vol. 46, May/Aug. 1960

Ledersteger, K.: **Die Abplattungsfunktion einparametriger sphäroidischer Gleichgewichtsfiguren,** [The flattening function of one-parameter spheroidal figures of equilibrium], p. 1–10

Xanthakis, John: **The sunspot areas and the relative sunspot numbers,** p. 11–22

Tengström, Erik: **An approximate method for calculating the depth of a surface-reaching gravitational mass-anomaly, giving a Bouguer-field with radial or axial symmetry,** p. 23–25

Weber, Max: **P.G.-Seismographen und ihre Eichung,** [Pendulum galvanometer seismographs and their calibration], p. 26–32

Weber, Max: **Das ebene Interpretationsproblem der seismischen Lotung in einem zweiachsig inhomogenen Körper,** [The plane interpretation problem of seismic sounding in a biaxially inhomogeneous body], p. 33–36

Ben-Menahem, Ari and Båth, Markus: **A method for determination of epicenters of near earthquakes,** p. 37–46

Szendrei, M. E.: **The frequency content and attenuation of seismic wavelets along the surface of different types of soil,** p. 47–65

Scheidegger, A. E.: **On the connection between tectonic stresses and well fracturing data,** p. 66–76

Frölich, F. and Stiller, H.: **Some results of laboratory investigations of magnetic rock samples (serpentinites),** p. 77–82

Crea, Antonio: **Perturbazione indotta nel campo di un elettrodo rettilineo Indefinito da un piano perfettamente conduttore parallelo all'elettrodo,** [Disturbance induced in the field of an indefinite rectilinear electrode from a perfectly conducting plane parallel to the electrode], p. 83–94

Stavrou, A.: **The magnetic observatory of Pendeli, Athens, Greece,** p. 95–109

Rau, W.: **Die Zeitlichen Änderungen des atmosphärischen Gefrierkerngehalts und ihre Beziehungen zu den Meteorströmen und zur atmosphärischen Zirkulation,** [The time-dependent variations of the atmospheric freezing nuclei content and their correlations with meteor streams and with atmospheric circulation], p. 110–124

Dolezalek, H.: **Zur Berechnung des luftelektrischen Stromkreises III: Kontrolle des Ohmschen Gesetzes durch Messung,** [Computation of the atmospheric electricity circuit, Pt. 3 Checking Ohm's Law by measurements], p. 125–144

Rich, T. A.; Pollak, L. W. and Metnieks, A. L.: **Experiments with condensation nucleus size spectrometers,** p. 145–163

Metnieks, A. L.: **A modification of the dynamic method for determining the diffusion coefficient of aerosols,** p. 164–166

Bossolasco, M. and Elena, A.: **On the lunar semidiurnal variation of the *D* and *F*2 layers,** p. 167–172

Čadež, M.: **Strahlstrom und der durch Turbulenz verursachte Transport der mechanischen Energie in der Atmosphäre,** [Jet stream and turbulent transfer of mechanical energy in the atmosphere], p. 173–189
Karapiperis, Leon N.: **On the variation of the Etesians within the sunspot cycle,** p. 190–192
Reiter, Elmar R.: **The detailed structure of the atmosphere near jet streams,** p. 193–200
Facy, Léopold: **Les mécanismes naturels de lessivage de l'atmosphère,** [The natural mechanisms of the washing out of the atmosphere], p. 201–215
Kondrat'ev, K. Ia. and Niilisk, H. I.: **On the question of carbon dioxide heat radiation in the atmosphere,** p. 216–230
Kondrat'ev, K. Ia. and Niilisk, H. I.: **Comparison of radiation charts,** p. 231–240
Rieker, Jean: **Le lever du soleil dans l'ionosphère et ses répercussions sur la propagation des ondes longues,** [Sunrise in the ionosphere and its effects on long wave propagation], p. 241–328
Berlage, H. P. and de Boer, H. J.: **On the Southern Oscillation, its way of operation and how it affects pressure patterns in the higher latitudes,** p. 329–351
Eltantawy, A. I.: **Jet stream clouds in the Middle East,** p. 354–359

Geografiska Annaler, Stockholm, Vol. 42, No. 1, 1960

Bailey, Harry P.: **Method of determining the warmth and temperateness of climate,** p. 1–16
Reiter, Elmar R. and Heuberger, Helmut: **A synoptic example of the retreat of the Indian summer monsoon,** p. 17–35
Barry, R. G.: **The application of synoptic studies in palaeoclimatology: a case study for Labrador-Ungava,** p. 36–44
Hattersley-Smith, G.: **Some remarks on glaciers and climate in north Ellesmere Island,** p. 45–48
Derbyshire, Edward: **Glaciation and subsequent climatic changes in central Quebec-Labrador: a critical review,** p. 49–61
Schytt, Valter: **Regime studies on Storglaciären, Kebnekajse during 1960,** p. 62–63

Hemel en Dampkring, The Hague, Vol. 58, No. 6, June 1960

Blaauw, A. and Raimond, J. J.: **In memoriam Prof. Dr. P. J. Van Rhijn,** p. 137–139
Meeus, Jean: **De totale zonsverduistering van 15.2.1961,** [The total solar eclipse on 15.2.1961], p. 139–145
De Jager, C.: **Natriumsporen in de hoge atmosfeer,** [Sodium trails in the upper atmosphere], p. 146–151
Veldkamp, J.: **Een gat door de aardkorst?,** [A hole through the earth's crust?], p. 151–153
De Boer, H. J.: **De doorlaatbaarheid van de atmosfeer boven de Zuidpool en boven Nederland,** [Transparency of the atmosphere above the South Pole and above the Netherlands], p. 154–157

Vol. 58, No. 7/8, July/Aug. 1960

de Feiter, L. D.: **De exosfeer: atmosferische fluittoontjes en radiostraling uit de aardse korona,** [The exosphere: atmospheric whistlers and radio radiation from earth's corona], p. 161–181

Vol. 58, No. 9, Sept. 1960

Meeus, Jean: **De bedekkingen van Aldebaran en Regulus in 1961 en 1962,** [Occultations of Aldebaran and Regulus in 1961 and 1962], p. 193–204
Peeters, P. J.: **Het fotograferen van nachtelijke onweders op grote afstand,** [Telephotography of nocturnal thunderclouds], p. 205–209

Vol. 58, No. 10, Oct. 1960

Lippincott, Sarah L. and Van de Kamp, P.: **Ross 614 en Luyten 726-8– de sterren met de kleinst bekende massa's,** [Ross 614 and Luyten 726–8: the stars with the smallest known masses], p. 217–224
Ten Kate, H.: **De zeer natte zomer van 1960,** [The very rainy summer of 1960], p. 225–226
Scharringa, H.: **Beoordeling van zomers,** [Classification of summers], p. 227–230

Vol. 58, No. 11, Nov. 1960

Meeus, Jean: **Venus als avondster,** [Venus as evening star], p. 237–241
Ernst, Bruno: **Volksterrenwachten en volksontwikkeling in Duitsland en Zwitzerland,** [Popul observatories and national education in Germany and Switzerland], p. 242–245
Van Der Woude, D. M. and Feteris, P. J.: **Een buienwolk in statu nascendi,** [A shower cloud *statu nascendi*], p. 246–248
Visser, S. W.: **Onweer in warme wolken,** [Thunderstorm in warm clouds], p. 249–251
Raimond, J. J., Jr.: **De gouden ganzeveer uitgereikt aan Prof. Oort,** [The golden goose feath for Prof. Oort], p. 252–253
Oort, J. H.: **Maatschappij en zuivere wetenschap,** [Society and pure science], p. 254–255

Indian Journal of Meteorology and Geophysics, Delhi, Vol. 11, No. 4, Oct. 1960

Kelkar, V. N.: **Size distribution of raindrops, Pt. 2,** p. 323–330
Ramana Murthy, Bh. V.; Biswas, K. R. and Ghosh Dastidar, B. K.: **Incidence of 'warm' ar 'cold' rain in and around Delhi and their contributions to season's rainfall,** p. 331–346
Khvostikov, I. A. and Megrelishvili, T. G.: **The structure of the twilight ray in different spectr regions,** p. 347–362
Bhargava, B. N. and Subrahmanyam, R. V.: **Movements in the F region of the ionosphe during solar eclipses,** p. 363–370
Pant, P. S.: **Diurnal variation of upper air temperatures,** p. 371–376
Mallik, A. K.; Jagannathan, P.; Rama Rao, G. and Banerjee, J. R.: **Preliminary studies crop-weather relationships: cotton,** p. 377–382
The Indian Meteorological Society, p. 383
New office building of the Regional Meteorological Center, Madras, p. 386–387
Visit of the Minister for Transport and Communications to Meteorological offices at Colab Bombay and Poona, p. 388–389
Inauguration of new solar installations at the Astrophysical Observatory, Kodaikanal, p. 390–3
Severe thundersquall at Dum Dum airport, June 14, 1960, p. 393
Solar, geomagnetic, ionospheric and ozone data, p. 397–404
Williams, S. D.: **Incidence of fog over Bangalore airfield,** p. 405–408
Venkataraman, R. and Balasubramanian, C.: **Diurnal range of temperature at Coimbator** p. 409–412
Rai, D. B.: **Angel observation in association with sea breeze,** p. 412–416
De, A. C.: **Radar photograph of Bay coast,** p. 417
De, A. C.: [**Comment on his**] **A high altitude radiosonde ascent at Dum Dum,** p. 418
Korkhao, J. M.: [**Comments on**] **V. Srinivasan: Southwest monsoon rainfall in Gangetic We Bengal and its associations with upper air flow patterns, and** [**Reply by**] **Srinivasa** p. 418–420
IGY Bulletin, Wash., D. C., No. 40, Oct. 1960 (This **Bulletin** is issued as section of the **America Geophysical Union, Transactions,** 41(4):685–700, Dec. 1960, and listing of articles may seen under that title)
IGY Bulletin, Wash., D. C., No. 41, Nov. 1960 (*AGU Transactions,* 41(4):701–716, Dec. 196
IGY Bulletin, Wash., D. C., No. 42, Dec. 1960 (*AGU Transactions,* 41(4):717–732, Dec. 196

Iran. Meteorological Dept., Meteorological Yearbook, 1957, pub. 1960

Shenavar, A. and Hoyle, H. D.: **Surface winds at Tehran and Abadan: some notes on rece frequency computations,** p. 5–8
Shenavar, A. and Hoyle, H. D.: **Normal temperatures at Tehran and Abadan: a useful di grammatic presentation,** p. 9–12
Weickmann, L.: **Problems connected with the reduction of barometric pressure to mean se level for stations located upon the high plateau of Iran,** p. 13–18
Weickmann, L.: **Diagrams for the quick application of methods of indirect aerology,** p. 19–27
Rassekh, M.: **Minimum daily temperatures during the onset of winter in Tehran,** p. 28–30
Ganji, M. H.: [**Obituary of**] **Herbert Donald Hoyle,** p. 31–32

Journal of Atmospheric and Terrestrial Physics, London, Vol. 19, No. 3/4, Dec. 1960

Lyon, A. J.; Skinner, N. J. and Wright, R. W. H.: **The belt of equatorial spread-F,** p. 145–1
Robinson, B. J.: **On some disturbances in the E-region,** p. 160–171

Mitra, S. N.; Vij, K. K. and Dasgupta, P.: **Horizontal drift in the ionosphere over Delhi,** p. 172–183
Maeda, Kaichi: **Directional dependence of atmospheric temperature effects on cosmic-ray muons at sea-level,** p. 184–245
Hultqvist, B. and Gustafsson, G.: **On the magnetic time dependence of the auroral zone currents,** p. 246–259
Macrakis, M. S.: **A possible long-range communications link between ground and low-orbiting satellites,** p. 260–271
Kent, G. S.: **The fading of radio waves reflected obliquely from meteor trails,** p. 272–283
Maeda, H. and Yamamoto, M.: **Daytime enhancement of the amplitude of geomagnetic sudden impulses in the equatorial region,** p. 284–287
Brenan, P. M.: **The correlation of radio source scintillation in the Southern and Northern Hemispheres,** p. 287–289
Watkins, C. D.: **The magnetic storm-time variation of radio star scintillations and auroral radio echoes,** p. 289–292
Nelson, J. H.: **The gyromagnetic ratio of the proton,** p. 292
Indices of geomagnetic activity of the Observatories Hartland (Ha), Eskdalemuir (Es) and Lerwick (Le) May–August 1960, p. 296–299

Vol. 20, No. 1, Feb. 1961

Mathews, W. G. and Wallace L.: **Auroral temperature determination from $A^2\Pi \rightarrow X^2\Sigma$ bands of the N_2+ molecule,** p. 1–8
Bowhill, S. A.: **The scattering of radio waves by an extended randomly refracting medium,** p. 9–18
Bowhill, S. A.: **The effective recombination coefficient of an ionosphere containing a mixture of ions,** p. 19–30
Heading, J.: **Analytical considerations of ionospheric windows for low frequency radio waves,** p. 31–39
White, J.; Porter, N. A. and Long, C. D.: **Observations on Čerenkov radiation from the night sky,** p. 40–48
Whitehead, J. D.: **The formation of the sporadic-E layer in the temperate zones,** p. 49–58
Gruber, S.: **Statistical analysis of radio star scintillation,** p. 59–71
Shapley, A. H.: **International Geophysical calendar for 1961,** p. 72–76
Donahue, T. M.: **A note on polar black outs,** p. 76–79
Mühleisen, R.: **Electrode effect measurements above the sea,** p. 79–81
Bhargava, B. N. and Subrahmanyan, R. V.: **Geomagnetic disturbance effects in equatorial E_s,** p. 81–84

Journal of Geophysical Research, Wash., D. C., Vol. 66, No. 2, Feb. 1961

Cladis, J. B. and Dessler, A. J.: **X-rays from Van Allen belt electrons,** p. 343–350
Armstrong, A. H.; Harrison, F. B.; Hechman, H. H. and Rosen, L.: **Charged particles in the inner Van Allen radiation belt,** p. 351–357
Wentzel, Donat G.: **Hydromagnetic waves and the trapped radiation, Pt. 1–2,** p. 359–369
Hibbs, A. R.: **The distribution of micrometeorites near the Earth,** p. 371–377
Chilton, Charles J.: **VLF phase perturbation associated with meteor shower ionization,** p. 379–383
Athay, R. Grant: **Sources of solar ultraviolet radiation,** p. 385–390
Elwert, G.: **Theory of X-ray emission of the Sun,** p. 391–401
Musen, Peter: **The theory of artificial satellites in terms of the orbital true longitude,** p. 403–409
Cohen, Marshall H. and Dwarkin, Martin L.: **Perpendicular intersections with a dipole field,** p. 411–419
Leadabrand, Ray L.: **A note on the disposition of daytime auroral ionization in space,** p. 421–428
Gregory, John B.: **Radio wave reflections from the mesosphere, Pt. 1, Heights of occurrence,** p. 429–428
Bates, Howard F.: **The slant *Es* echo: a high-frequency auroral echo,** p. 447–454
Nordberg, W. and Stroud, W. G.: **Results of IGY rocket-grenade experiments to measure temperatures and winds above the Island of Guam,** p. 455–464
Mantis, Homer T.: **Observation of infrared cooling of a tropical air mass,** p. 465–476
Takahashi, Taro: **Carbon dioxide in the atmosphere and in Atlantic Ocean water,** p. 477–494
Le Méhauté, B.: **A theoretical study of waves breaking at an angle with a shore line,** p. 495–499

Chappelear, J. E.: **Direct numerical calculation of wave properties,** p. 501–508
Toksöz, Sadik and Kirkham, Don: **Graphical solution and interpretation of a new drain-spacing formula,** p. 509–516
Hall, Warren A. and Burns, Nathan: **The dynamic programming approach to water-resources development,** p. 517–520
Bender, Donald L. and Roberson, John A.: **The use of a dimensionless unit hydrograph to derive unit hydrographs for some Pacific Northwest basins,** p. 521–527
Deardorff, James W.: **Local evaporation from a smooth water surface,** p. 529–534
Marlatt, W. E.; Havens, A. V.; Willits, N. A. and Brill, G. D.: **A comparison of computed and measured soil moisture under snap beans,** p. 535–541
Roy, Amalendu: **On some properties of residuals and derivatives,** p. 543–548
Irving, E. and Tarling, D. H.: **The paleomagnetism of the Aden Volcanics,** p. 549–556
Yungul, S. H.: **Time variations of the ellipticity and preferred direction of the P_S telluric field,** p. 557–561
Jaeger, J. C.: **The effect of the drilling fluid on temperatures measured in bore holes,** p. 563–569
Philip, J. R.: **The theory of heat flux meters,** p. 571–579
Peselnick, Louis and Outerbridge, W. F.: **Internal friction in shear and shear modulus of Solenhofen limestone over a frequency range of 10^7 cycles per second,** p. 581–588
Fry, John C. and Raitt, Russell W.: **Sound velocities at the surface of deep sea sediments,** p. 589–597
Narans, Harry D., Jr.; Berg, Joseph W., Jr. and Cook, Kenneth L.: **Sub-basement seismic reflections in northern Utah,** p. 599–603
Benioff, Hugo; Press, Frank and Smith, Stewart: **Excitation of the free oscillations of the Earth by earthquakes,** p. 605–619
Ness, N. F.; Harrison, J. C. and Slichter, L. B.: **Observations of the free oscillations of the Earth,** p. 621–629
Alsop, Leonard E.; Sutton, George H. and Ewing, Maurice: **Free oscillations of the Earth observed on strain and pendulum seismographs,** p. 631–641
Bogert, B. P.: **An observation of free oscillations of the Earth,** p. 643–646
van Wijk, A. M.: **Magnetic effects of high-altitude nuclear detonations,** p. 647–648
Harrison, A. E.: **Fluctuations of the Coleman Glacier, Mt. Baker, Washington,** p. 649–650
Hughes, M. P.: **Solar radio emissions and geophysical disturbances during July 1959,** p. 651–653
Yeh, K. C. and Swenson, G. W., Jr.: **Observed field strength in the neighborhood of the skip distance,** p. 654–656
Marston, Richard B.: **Substitution of small cans for Weather Bureau pans in measuring evaporation,** p. 657–659
Lincoln, J. Virginia: **Geomagnetic and solar data,** p. 660–661

Journal of Meteorological Research, Tokyo, Vol. 12, No. 8, Aug. 1960

Shibayama, T.: **Forecasting the movement of typhoon by 500–1000 mb thickness chart,** p. 509–517
Kinoshita, M.: **Notes on the forecasting of gustwindstorms in the East China Sea and off Kyūshū in winter (General report on gustwindstorms, Pt. 1),** p. 518–523
Yasuda, K.: **An estimation of precipitation amount due to cold front,** p. 524–529
Kanō, K.: **On the wind tunnel tests of 4-cup anemometers,** p. 530–534
Yajima, Y.: **On the response of thermometer,** p. 535–537
Imayama, M. and Kojima, T.: **Statistical investigation on the drought in summer in Kyūshū District and Yamaguchi Prefecture,** p. 538–559
Gōda, I.: **On the relation between small rainfall in June and total rainfall in July in Setouchi District,** p. 560–563
Miyazawa, S.: **An objective forecasting of rainfall amount in Bai-u season in Hokuriku District,** p. 564–568
Ikeda, H.: **On a method of seasonal forecasting,** p. 569–575
Miyoshi, T.: **Statistical studies on precipitation by typhoon,** p. 576–580
Ninomiya, K.: **On the variation of divergence with height and time,** p. 581–583
Nemoto, J.: **[Comments on] T. Watanabe: Theoretical studies on meteorological damage, Pt. 1, On the disaster function, and [Reply by] Watanabe,** p. 584–586

Vol. 12, No. 9, Sept. 1960

Yamada, N.; Sakai, S. and Hamada, N.: **On the geostrophic tailwind component along some transoceanic air routes over the North Pacific area,** p. 587–592

Yasuda, K.: **Behaviour of moisture and wind fields in the middle and lower troposphere over the Far East, Pt. 1, Preliminary report on rainy season,** p. 593–601
Yajima, Y.: **Response of thermometer: a note on the measurements of temperature,** p. 602–609
Hoshino, T. (comp.): **Investigations on the typhoon no. 5821 in 1958,** p. 610–645
Yasui, Y.: **Statistical investigation on eruption and tremors of volcano Sakurajima in relation to tide and atmospheric pressure,** p. 646–674
Fujimoto, K.: **Some investigations on snowfall forecast at Izuhara,** p. 675–678
Yamada, S.: [**Comment on**] **S. Ōtsuka and M. Ōnuki: A radar detection of the local heavy rainfall at Utsunomiya from Aug. 6th to 7th, 1957 and** [**Reply by**] **Ōtsuka and Ōnuki,** p. 679–680

Leningrad. Glavnaia Geofizicheskaia Observatoriia, Trudy, No. 68, 1957

Shifrin, K. S. and Minin, I. N.: **K teorii negorizontal'noĭ vidimosti,** [Theory of nonhorizontal visibility], p. 5–75
Barteneva, O. D.: **Ustanovka i metodika issledovaniia tochnosti izmeriteleĭ vidimosti,** [Equipment and methods for the investigation of the accuracy of visibility meters], p. 76–87
Poliakova, E. A.: **Eksperimental'naia proverka formuly dlia koeffitsienta oslableniia sveta v dozhde,** [Experimental testing of the formula for the coefficient of attenuation of light in rain], p. 89–91
Poliakova, E. A.: **Issledovania mikrostruktury dozhdeĭ v sviazi s voprosom ob ikh prozrachnosti,** [Study of the microstructure of rain in connection with the problem of its transparency], p. 92–97
Voĭtikova, T. D.: **K metodike izmereniia razmerov dozhdevykh kapel',** [Methods for the measurement of the size of raindrops], p. 98–101
Ianishevskiĭ, Iu. D.: **Fotometricheskie nabliudeniia v Pavlovske i sootnoshenie mezhdu svetom i radiatsieĭ,** [Photometric observations carried out in Pavlovsk and correlations between light and radiation], p. 102–119
Barteneva, O. D. and Guseva, L. N.: **Rezhim estestvennoĭ osveshchennosti v zavisimosti ot meteorologicheskikh usloviĭ,** [Regime of natural illumination as influenced by meteorological conditions], p. 120–131
Krasil'shchikov, L. B. and Piatovskaia, N. P.: **Spektral'nye indikatrisy otrazheniia nekotorykh poverkhnosteĭ pri estestvennom osveshchenii v oblachnyĭ den',** [Spectral reflection indices of some surfaces during natural illumination on a cloudy day], p. 132–139
Shifrin, K. S. and Piatovskaia, N. P.: **Ob indikatrisakh iarkosti estestvennykh poverkhnosteĭ,** [Brightness indices of natural surfaces], p. 140–151
Krasil'shchikov, L. B.; Golikova, O. I. and Novosel'tsev, E. P.: **Fotoelektricheskie izmereniia spektral'nykh otnositel'nykh koeffitsientov iarkosti,** [Photoelectrical measurements of spectral relative brightness coefficients], p. 152–163
Ter-Markariants, N. E.: **Zavisimost' koeffitsienta otrazheniia vody ot dliny volny padaiushchego sveta,** [Dependence of the reflection coefficient of water on the wave length of falling light], p. 164–165
Ter-Markariants, N. E.: **Ob otrazhenii radiatsii morem pri nalichii volneniia,** [Radiation reflection from the sea during wave activity], p. 166–171
Grishchenko, D. L.: **O luchistoĭ energii Solntsa, pronikaiushcheĭ v more,** [Solar radiant energy penetrating into the sea], p. 172–177
Ter-Markariants, N. E.: **Obratnoe rasseianie radiatsii morem,** [Back scattering of radiation by the sea], p. 178–180
Barashkova, E. P.: **Sootnoshenie mezhdu priamoĭ i rasseiannoĭ radiatsieĭ,** [Correlations between direct and diffuse radiation], p. 181–183
Barashkova, E. P.: **Priamaia radiatsiia v Karadage,** [Direct radiation in Karadag], p. 184–194
Gavrilova, M. K.: **Summarnaia radiatsiia v Aliaske,** [Global radiation in Alaska], p. 195–203
Ross, Iu. K.: **O zavisimosti perevodnogo mnozhitelia otnositel'nykh aktinometrov ot temperatury,** [Temperature dependence of the reduction factor of relative actinometers], p. 204–208

Meteorological Society of Japan, Tokyo, Journal, Ser. 2, Vol. 38, No. 4, Aug. 1960

Takahashi, K.; Katayama, A. and Asakura, T.: **A numerical experiment of the atmospheric radiation,** p. 175–181
Magono, Choji and Orikasa, Keitaro: **On the surface electric field during rainfall (Charge on raindrops and rainfall intensity),** p. 182–194

Sano, I.; Fujitani, Y. and Uzu, Y.: **An experiment on the freezing of electrolyte-containing water droplets,** p. 195–199
Ito, N.: **On the evaporation from a few lakes in Japan,** p. 200–206
Okita, T.: **Estimation of direction of air flow from observation of rime ice,** p. 207–209
Matsuoka, H.: **Similarity principle applied to large-scale atmospheric perturbations,** p. 210–212

Vol. 38, No. 5, Oct. 1960

Isono, K. and Ikebe, Y.: **On the ice-nucleating ability of rock-forming minerals and soil particles,** p. 213–230
Kobayashi, T.: **Experimental researches on the snow crystal habit and growth using a convection-mixing chamber,** p. 231–238
Matsumoto, Seiichi: **A role of static stability as a parameter of atmospheric models,** p. 239–249
Sawada, T.: **On the transition of ice-limit and ice-thickness for the early drift-ice season on the Okhotsk Sea,** p. 250–258

Vol. 38, No. 6, Dec. 1960

Miyakoda, K.: **The methods of numerical time integration of one-dimensional linear equations and their inherited errors,** p. 259–287
Kurihara, Y.: **Numerical analysis of atmospheric motions,** p. 288–304
Nishimoto, S.: **A dynamic theory on the displacement of a circular model perturbation at the non-divergent level and its application to forecasting of the displacement of typhoon,** p. 305–313

Meteorologiia i Gidrologiia, Moscow, No. 9, Sept. 1960

Drogaĭtsev, D. A.: **Metod dolgosrochnogo prognoza osadkov na period s aprelia po iiun',** [A method of making long range forecasts of precipitation for the period from April to June], p. 3–10
Matveev, L. T.: **Ispol'zovanie empiricheskikh funktsiĭ vliianiia dlia prognoza granits oblachnosti,** [The use of empirical influence functions for forecasting cloud base], p. 11–15
Sheremetevskaia, O. I.: **Uchet stratifikatsii vozdukha v raschetakh ispareniia i teploobmena,** [Taking account of the stratification of the air in computations of evaporation and heat exchange], p. 16–22
Koshinskiĭ, S. D.: **Primenenie statistiki pri issledovanii sinopticheskikh usloviĭ vypadeniia osadkov v Azerbaĭdzhane,** [The application of statistics to the study of synoptic conditions of precipitation in Azerbaidzhan], p. 23–26
Klimenko, L. V.: **Sviaz' zimnego temperaturnogo rezhima na Evropeĭskoĭ territorii SSSR s solnechnoĭ aktivnost'iu,** [The relationship between the winter temperature regime over the European U.S.S.R. and solar activity], p. 26–29
Tydel'skaia, R. O.: **O putiakh usovershenstvovaniia metodiki obrabotki signalov radiozonda A-22-III,** [On ways of improving the methods of analyzing the signals from the A-22-III radiosonde], p. 35–38
Ognev, B. I. and Uzun, A. T.: **Vliiani polozheniia urovnia zhidkosti v isparitel'noĭ ustanovke na skorost' isparenіia,** [The influence of the position of the liquid level in evaporation instruments on the speed of evaporation], p. 41–43
Shenderovich, I. M.: **Registratory dlinnykh okeanskikh voln (obzor literatury),** [Instruments for measuring ocean wave-lengths. (Review of the literature], p. 44–48
Mertsalov, A. N.: **Chislo sharopilotnykh dannykh, neobkhodimoe dlia rascheta divergentsii skorosti vetra,** [The number of pilot balloon soundings necessary for the computation of the divergence of the wind speed], p. 49–51
Popov, N. I.: **O vsesoiuznom soveshchanii po ionosfere,** [On the All-Union Conference on the Ionosphere], p. 63

No. 10, Oct. 1960

Iurgenson, A. P.: **Issledovanie struktury turbulentnykh dvizheniĭ, vyzyvaiushchikh boltanku sovremennykh samoletov,** [Research on the structure of turbulent motion giving rise to bumpiness in present day aircraft], p. 3–8
Morskoĭ, G. I.: **Opyt prognoza kart srednemesiachnykh znacheniĭ H_{500},** [A trial of forecasts of charts of mean monthly values of the 500 mb height], p. 9–13

Zverev, N. I. and Ped', D. A.: **Opredelenie analogichnosti poleĭ meteorologicheskikh elementov pri pomoshchi elektronnoĭ schetnoĭ mashiny "Pogoda,"** [The determination of analogy between fields of meteorological elements using the electronic computer "Pogoda"], p. 14–18

Kropachev, L. N. and Bogdanova, A. K.: **O kolebaniiakh urovnia Azovskogo moria,** [Variations in the level of the Sea of Azov], p. 19–26

Novozhilov, N. I.: **O roli dinamicheskoĭ turbulentnosti v razvitii konvektsii,** [Role of dynamic turbulence in the development of convection], p. 27–29

Kondrat'ev, K. Ia.: **K voprosu o vliianii al'bedo podstilaiushcheĭ poverkhnosti na radiatsionnyĭ rezhim v usloviiakh Arktiki i Antarktiki,** [On the influence of the albedo of the under-lying surface on the radiation regime in Arctic and Antarctic conditions], p. 29–30

Lugchenko, A. K. and Moshnikov, A. N.: **Sostavlenie kart vysoty verkhneĭ granitsy oblakov nizhnego iarusa,** [Construction of charts giving the upper boundary of a low cloud layer], p. 30–33

Dobrovol'skaia, V. K. and Pekhovich, A. I.: **Eksperimental'noe issledovania vliianiia vetrovogo volneniia na ledoobrazovanie v vodokhranilishchakh,** [Experimental research on the influence of wind waves on the formation of ice in reservoirs], p. 33–36

Vladimirov, O. A.: **Raschet uvelicheniia ploshchadi moria pri volnenii,** [Calculation of the increase of the area of the sea surface with waves], p. 36–37

Kupetskiĭ, V. N.: **Novoe o starom metode butylochnoĭ pochty,** [New developments in the old method of drift bottle releases], p. 37

Vlasov, A. F.: **Opyt agrometeorologicheskogo obsluzhivaniia kolkhozov i sovkhozov gidrometeorologicheskimi stantsiiami,** [The experience of the collective and Soviet farms of the agrometeorological service from the hydrometeorological stations], p. 38–40

Gavrilova, K. N. and Piatnitskaia, E. N.: **Rabota operativnoĭ gruppy po agrometeorologicheskomu obsluzhivaniiu uborochnoĭ kampanii,** [The work of the Agrometeorological Service's operational group during the harvest period], p. 40–41

Lagranzh, R. V.: **O tochnosti ucheta zimnikh osadkov v usloviiakh Zapoliar'ia,** [Accuracy of the estimate of winter precipitation in the Arctic regions], p. 42–45

Sorkina, A. I.: **Nekotorye voprosy metodiki izmereniia vetra nad morem,** [Some problems on methods of measuring the wind over the sea], p. 45–47

Kolobkov, N. V.: **Vydaiushchiesia iavleniia pogody v ianvare-aprele 1960g,** [Outstanding weather phenomemon in Jan.–April 1960], p. 48–50

Kulik, M. S. and Sagatovskiĭ: **O nauchnykh trudakh po agrometeorologii Kazakhskogo nauchno-issledovatel'skogo gidrometeorologicheskogo instituta,** [Scientific agrometeorological work of the Kazakh Scientific Research Hydrometeorological Institute], p. 51–55

Skliarov, V. M.: **[Obituary of] Krichak, O. G.; Belolikov, A. M.; Dergach, A. L.; Popov, I. A.; Samushkov, V. I.; Smirnov, A. Z.; Kostka, O. and Popp, G. Kh.,** p. 59–63

Khmaladze, G. N.: **Konferentsiia po izucheniiu snezhnogo pokrova i lednikov Kavkaza,** [Conference on snow cover and glaciers in the Caucasus], p. 64–65

Meteorologische Rundschau, Berlin, Vol. 13, No. 6, Nov./Dec. 1960

Knoch, K.: **[Obituary of] Georg Lüdeling 1863–1960,** p. 161–162

Roth, R.: **Ein Vergleich berechneter und gemessener Tauwerte,** [A comparison of computed and measured amounts of dew], p. 162–165

Burckhardt, H.: **Richtlinien für die Frostschutzberegnung,** [Guide lines for frost protection sprinkling], p. 165–168

Müller-Annen, Hans: **Über die Schwankungen der Zonal-Zirkulation, Teil 1, Die Zonal-Zirkulation und die Höhe der Sonnenfleckenzyklen,** [On the variations in the zonal circulation, Pt. 1, The zonal circulation and the height of the sunspot cycle], p. 169–172

Müller-Annen, Hans: **Über die Schwankungen der Zonal-Zirkulation, Teil 2, Die Zonal-Zirkulation und ihre Beziehungen zu den Sonnenflecken-Relativzahlen und der Solarkonstante,** [On the variations in the zonal circulation, Pt. 2, The zonal circulation and its relation to the relative sunspot numbers and the solar constant], p. 172–178

Partl, Willibald and Tanck, H.-J.: **Die Bestimmung der Tropopause vom Strahlturbinenflugzeug aus,** [The determination of the tropopause from turbo-jet planes], p. 178–180

Fink, Camillo: **Der Regenintensitätsschreiber: ein Registriergerät für die Zeitdauer und die Intensität von Niederschlägen,** [The rain intensity recorder: a registering device for the duration and intensity of precipitation], p. 180–182

Hofmann, Alfred: **Die Struktur von Druck-Vorhersagen: ein Beitrag zur Frage der Vorhersageprüfung,** [The structure of pressure forecasts: a contribution on the problem of forecast verification], p. 182–184

Monthly Weather Review, Wash., D. C., Vol. 89, No. 1, Jan. 1961

Smith, Robert L. and Holmes, David W.: **Use of Doppler radar in meteorological observations,** p. 1–7
Publications by Weather Bureau authors, p. 8
Sourbeer, Robert H. and Gentry, R. Cecil: **Rainstorm in southern Florida, Jan. 21, 1957,** p. 9–16
Colson, DeVer; Lindsay, Charles V. and Hand, James M.: **Radar echo of a mountain wave on Feb. 15, 1960,** p. 17–19
Dinwiddie, Frank B.: **Tornadoes near Nags Head, N. C., in May and June 1960,** p. 20–23
Andrews, James F.: **The weather and circulation of Oct. 1960,** p. 24–30

Vol. 89, No. 2, Feb. 1961

Vestal, C. K.: **The precipitation day statistic,** p. 31–37
Weather Bureau technical news; electronic weather map "Plotter," p. 38
Frederick, Ralph H.: **A study of the effect of tree leaves on wind movement,** p. 39–44
Ropar, N. J. and Gray, T. I., Jr.: **Description of the 50-mb patterns over Antarctica in 1958,** p. 45–52
New Weather Bureau publication [The Cooperative Weather Observer], p. 52
O'Connor, James F.: **The weather and circulation of November 1960; another November with a mid-month reversal,** p. 53–58

Moscow. Tsentral'nyĭ Institut Prognozov, Trudy, No. 93, 1960

Mashkovich, S. A. and Kheĭfets, Ia. M.: **K teorii dolgosrochnogo prognoza s uchetom vertikal'noĭ stratifikatsii atmosfery i turbulentnogo peremeshivaniia,** [Theory of long range forecasting with consideration of the vertical stratification of the atmosphere and turbulent mixing], p. 3–15
Kheĭfets, Ia. M. and Shishkova, I. A.: **Usovershenstvovanie metodiki dolgosrochnogo prognoza kart absoliutnoĭ topografii po barotropnoĭ modeli,** [Improving long range forecasting methods for absolute topography charts based on a barotropic model], p. 16–24
Belousov, S. L.: **K prognozu geopotentsiala na severnom polusharii v sluchae baroklinnoĭ atmosfery,** [Forecasting the geopotential of the Northern Hemisphere in the case of a baroclinic atmosphere], p. 25–34
Mashkovich, S. A.: **K gidrodinamicheskoĭ teorii atmosfernykh makroprotsessov,** [Hydrodynamic theory of atmospheric large scale processes], p. 35–37
Diubiuk, A. F.: **Uchet v prognoze baricheskogo polia nachal'nykh dannykh dvukh srokov,** [Taking into account initial data from two terms in forecasting the pressure field], p. 38–48
Mashkovich, S. A. and Ambartsumian, M.: **Ob otsenke tochnosti resheniia uravneniia vikhria metodom iteratsiĭ,** [Evaluation of the accuracy of a solution of the vorticity equation by the iteration method], p. 49–58
Alpatova, R. L.: **Otsenka tochnosti resheniia uravneniia Puassona razlichnymi chislennymi metodamy** [Evaluation of the accuracy of Poisson's equation by various numerical methods], p. 59–64
Sitnikov, I. G.: **Nekotorye rezul'taty gidrodinamicheskogo issledovaniia brizov,** [Some results of the hydrodynamic investigation of breezes], p. 65–78

Royal Meteorological Society, Quarterly Journal, Vol. 87, No. 371, Jan. 1961

Callendar, G. S.: **Temperature fluctuations and trends over the earth,** p. 1–12
Gerbier, N. and Berenger, M.: **Experimental studies of lee waves in the French Alps,** p. 13–23
Sawyer, J. S.: **Quasi-periodic wind variations with height in the lower stratosphere,** p. 24–33
Corby, G. A.: **Some experiments in the objective analysis of contour charts,** p. 34–42
Warren, F. W. G.: **The generation of wave energy at a fluid interface by the passage of a vertically moving slender body,** p. 43–54
Crossley, A. F.: **Ice accretion and turbulence on North Atlantic air routes,** p. 55–64
Jones, R. F.: **Layer cloud over southern England,** p. 65–71
Macklin, W. C. and Ludlam, F. H.: **The fallspeeds of hailstones,** p. 72–81
Smith, F. B. and Hay, J. S.: **The expansion of clusters of particles in the atmosphere,** p. 82–101
Houghton, J. T.: **The meteorological significance of remote measurements of infra-red emission from atmospheric carbon dioxide,** p. 102–104

O'Connor, T. C.; Sharkey, W. P. and Flanagan, V. P.: **Observations on the Aitken nuclei in Atlantic air,** p. 105–108
Panofsky, H. A.: **An alternative derivation of the diabatic wind profile,** p. 109–110
Scorer, R. S. et al.: [Discussion of] **H. L. Penman and I. F. Long: Weather in wheat and** [Reply by] **Penman,** p. 111–112
Scorer, R. S. et al.: [Discussion of] **J. L. Monteith and G. Szieczs: The carbon-dioxide flux over a field of sugar beet and** [Reply by] **Monteith,** p. 112–113
Penman, H. L. et al.: [Discussion of] **B. J. Mason and J. Maybank: The fragmentation and electrification of freezing water drops and** [Reply by] **Mason,** p. 113–114
Scorer, R. S. et al.: [Discussion of] **R. J. Murgatroyd and M. P. Garrod: Observations of precipitation elements in cumulus clouds and** [Reply by] **Murgatroyd,** p. 114–116
Jones, R. F. et al.: [Discussion of] **F. Singleton: Aircraft observations of rain and drizzle from layer clouds and** [Reply by] **Singleton,** p. 116

Royal Society of London, Proceedings, Ser. A, Vol. 256, No. 1285, June 21, 1960

MacDowall, J.: **Some observations at Halley Bay in seismology, glaciology and meteorology,** p. 149–197
Burton, J. M. C.: **The ice-shelf in the neighbourhood of Halley Bay,** p. 197–200
Bellchambers, W. H. and Piggott, W. R.: **The ionosphere over Halley Bay,** p. 200–218
MacDowall, J.: **Geomagnetic observations at Halley Bay,** p. 219–221
Brenan, P. M.: **Ionospheric drifts determined from radio-star scintillation observations,** p. 222–229
Harrison, D. P.: **Auroral radio echoes at Halley Bay,** p. 229–234
Evans, S.: **Systematic movements of aurorae at Halley Bay,** p. 234–240
Thomas, G. M.: **Auroral results from Halley Bay during the International Geophysical Year,** p. 241–244
McCrea, W. H.: **The origin of the solar system,** p. 245-266

Sendai District, Japan. Meteorological Observatory, Journal of Meteorological Research of Töhoku District, Vol. 13, March 1960

Kusano, K. and Shiraishi, Y.: **On the objective forecasting of precipitation amount in the Kitakami Basin caused by typhoon.** (*Memoir No.* 1)
Yamashita, H. and Sumino, M.: **Forecasting of rainfall amount by cold front associated with upper high-latitude trough, taking the basin of River Kitakami as a model.** (*Memoir No.* 2)
Tsuchiya, S.: **Determination of precipitation gage network in the Sagae River Basin of Yamagata Prefecture.** (*Memoir No.* 3)
Kobayashi, T.: **Comparison of parameters in summer runoff relation.** (*Memoir No.* 4)
Yoshida, S.: **Determination of the catching ratio of snow in various types of snow gauge and examination for the practical use of totalizer, (Study on totalizer, Pt. 2).** (*Memoir No.* 5)
Yoshida, S.: **Measurement of micro-tremor of the ground in the neighbourhood of Hachinohe thermal power station.** (*Memoir No.* 6)
Yoshida, S. and Nanba, S.: **Hydrometeorological research during the winter season, 1953–1956, in the upper region of the Tadami River.** (*Memoir No.* 7)
Matsukura, H. and Yaegashi, S.: **Regional characteristics of the cool summer, Pt. 2, Tohoku District.** (*Memoir No.* 8)

U. S. National Bureau of Standards, Journal of Research, Sec. D, Radio Propagation, Wash., D. C., Vol. 65, No. 1, Jan./Feb. 1961

Bowles, Kenneth L.: **Incoherent scattering by free electrons as a technique for studying the ionosphere and exosphere: some observations and theoretical considerations,** p. 1–14
Britt, C. O.; Tolbert, C. W. and Straiton, A. W.: **Radio wave absorption of several gases in the 100 to 117 kMc/s frequency range,** p. 15–18
Agy, Vaughn; Davies, Kenneth and Salaman, Roger: **An atlas of oblique-incidence ionograms (a digest),** p. 35–36
Wait, James R.: **A new approach to the mode theory of VLF propagation,** p. 37–46
Dobrott, D. and Ishimaru, A.: **East-west effect on VLF mode transmission across the Earth's magnetic field,** p. 47–52

Johler, J. Ralph: **Magneto-ionic propagation phenomena in low- and very-low-radiofrequency waves reflected by the ionosphere,** p. 53–65
Bean, B. R. and Cahoon, B. A.: **Correlation of monthly median transmission loss and refractive index profile characteristics,** p. 67–74
Miya, K.; Sasaki, T. and Ishikawa, M.: **Observation of F-layer and sporadic-E scatter at VHF in the Far East,** p. 93–99

Vaisala News, Helsinki, No. 6, July 1960

Wilska, Matti: **Thermometer lag coefficient of Väisälä radiosonde, type RS 12,** p. 3–5
Wilska, Matti: **Equipment for stellar triangulation,** p. 6–8
Toivola, Yrjö: **Training courses,** p. 9–11

Vsesoiuznoe Geograficheskoe Obshchestvo, Leningrad, Izvestiia, Vol. 92, No. 6, Nov./Dec. 1960

Kavrishvili, K. V.: **K landshaftnomu analizu basseĭna r. Gegi (severo-zapadnaia Gruziia),** [Environmental analysis of the Ghega River basin (N. W. Georgia)], p. 482–495
Avakian, A. B. and Sharapov, V. A.: **O klassifikatsii vodokhranilishch gidroėlektrostantsiĭ SSSR,** [Classification of reservoirs of hydroelectric power stations, U.S.S.R.], p. 515–521
Mishutin, D. A.: **Rezhim osadkov osnovnykh sinopticheskikh ob"ektov,** [Precipitation regime in the main synoptic processes], p. 521–524
Mikhaĭlov, Iu. D.: **O formirovanii ostatochnykh techeniĭ u mysov v moriakh s prilivami,** [Formation of residual currents near capes in tidal seas], p. 525–526

Weather, London, Vol. 16, No. 1, Jan. 1961

Gordon, A. H.: **Air mass transfer and the Northern Hemisphere summer of 1959,** p. 3–13
Berry, K.: **School weather station,** p. 14–16
Walton, K.: **Walton lightning recorder,** p. 18–26
Chuter, I. H.: **Wave clouds over Sicily,** p. 26–28

Yugoslavia. Hidrometeorološka Služba, Vesnik, Vol. 8, No. 1/2, Jan./June 1959

Makjanić, Berislav: **Metoda izanomala i razdioba temperature zraka u Jugoslaviji,** [Isanomaly method and air temperature pattern in Yugoslavia], p. 1–10
Jovičić, S.: **Prikaz dnevnih suma sračunatih vrednosti intenziteta direktnog sunčevog zračenja u našim krajevima,** [A representation of the daily sums of the computed values of the direct solar radiation intensity in our country], p. 10–22
Šikić, Mile: **Korelacioni odnosi izmedu prinosa kukuruza i nekih meteoroloških elemenata,** [Correlation between corn yield and some meteorological elements], p. 22–27
Dukanović, D.: **Ohladivanje po frigorigrafu Pfleiderer-a,** [Cooling according to Pfleiderer's frigorigraph], p. 27–32
Penzar, B.: **Razdioba Schulze-ovih koeficijenata godišnjeg hoda padavina u FNRJ,** [The distribution of the Schultze coefficients for the yearly variation of precipitation in Yugoslavia], p. 32–38
Pašić, H.: **Izvještaj o putu u Veliku Britaniju,** [The report on a trip to Great Britain], p. 38–44
Jovičić, S.: **O jednom načinu odredivanja srednjeg datuma neke pojave za klimatološke nizove u kojima se ta pojava nije javljala,** [Method for the determination of the mean date of a phenomenon in the climatological series in which this phenomenon did not regularly occur], p. 44–46
Malovčak, P.: **Tabelarni pregled i grafički prikaz broja toplih i vrućih dana i dana s toplom noći za grad Osijek u nizu od 1901–1955 godine,** [A tabular review and a graphical representation of the number of warm and hot days and of the days with warm nights for Osijek in the period 1901–1955], p. 47–55
Vujičić-Gamser, K.: **Vanredne vremenske pojave u FNRJ, juli-decembar 1958,** [Outstanding weather phenomena in Yugoslavia, July–December 1958], p. 56–58
Delijanić, Igor: **Rad Meteorološkog društva NR Srbije,** [Activity of the Serbian Meteorological Society], p. 59–62

Zeitschrift für Meteorologie, Berlin, Vol 14, No. 3, March 1960

Wörner, H.: **Messung der Himmelspolarisation in 5 Spektralbereichen,** [Measurement of polarization of the sky in 5 spectral bands], p. 57–75

Gerstmann, W.: **Über die Parallaxe zwischen Höhen- und Azimutbeobachtungen an den Enden einer Basis,** [Parallax between height and azimuth observations from the terminal points of a base], p. 75–79

Höhn, R. and Weide, R.: **Über den Streufehler der Freiberg-Sonde,** [Dispersion errors of Freiberg radiosonde], p. 79–84

Vol. 14, No. 4, April 1960

Wollkopf, K.-H.: **Die Umsteuerungen der Grosswetterlagen,** [Changes in large scale pressure patterns], p. 85–94

Wehner, Hans: **Häufigkeitsuntersuchung der Niederschlagszeiten und -intensitäten,** [Frequency investigations of precipitation times and intensities], p. 94–98

Marquardt, W.: **Radioaktive Schwaden als Folge der Saharabombe vom 13.II.1960,** [Radioactive gas clouds resulting from the Feb. 13, 1960 Sahara bomb], p. 98–100

Maede, Hans: **Regeln über die Umschläge von Grosswetterlagen bzw. Grosswettertypen,** [Rules on changes of large scale weather situations or large scale weather types], p. 100–102

Zöphel, Erika: **Nordlichtbeobachtung in Gardelegen,** [Auroral observation in Gardelegen], p. 102

Leo, Hans Peter: **Nordlichtbeobachtung in der Nacht vom 31. März zum 1. April 1960 in Wernigerode,** [Auroral observation on the night of March 31–April 1, 1960 at Wernigerode], p. 102

Georgi, J.: **Flugzeug-Kondensfahne erzeugt ausgedehntes Wolkenfeld,** [Extensive cloud area caused by a condensation trail], p. 102

PART IV. AUTHOR AND SUBJECT INDEXES

In this section will be found references to the number given at the head of each abstract or entry. In Part I each entry begins with the number 12.4, and in Part II in the Bibliography on Upper Atmosphere Structure from 30–80 km each entry begins with the number and letter 12D. This index is divided into three parts:

Index of Authors | Index of Subjects | Index of Geographical Locations

INDEX OF AUTHORS

Adamson, J., 12.4–205
Ainsworth, J., 12D–72, 12D–165, 12D–209
Alaska Univ. Geophysical Institute, 12.4–18, –114
Alekseev, P. P., 12D–171
Allan, H. F., 12D–191
Allcock, G. McK., 12.4–137
American Astronautical Society, 12.4–3
Anderson, K. A., 12.4–123, –124
Andrews, Mary L., 12.4–101
Angell, J. K., 12.4–194
Angelov, A., 12.4–227
Anido Artiles, A., 12D–57
Appleton, Sir E., 12.4–140, –141, –142, 12D–132
Appleton, E. V., 12.4–1
Arai, T., 12.4–294
Arakawa, H., 12.4–309
Argence, E., 12.4–128
Arkhangel'skii, V. N., 12D–39
Armour Research Foundation, 12.4–244
Arnold, A., 12D–150, –178, –190
Ash, R. S., 12.4–91
Ashburn, E. V., 12D–115
Ashford, O. M., 12.4–30
Ashwell, I. Y., 12.4–249
aufm Kampe, H. J., 12D–116, –126
Avco Corp. Research and Advanced Development Div., 12.4–242
Averbukh, S. K., 12.4–206

Bagariatskiĭ, B. A., 12.4–355
Bagrov, N. A., 12.4–234
Bailey, D. K., 12.4–127
Bandeen, W. R., 12D–184, –186, –198, –206
Barabashov, N. P., 12.4–105
Barbé, G. D., 12.4–235
Barbier, D., 12D–20
Barclay, F. R., 12.4–201
Barov, V. B., 12.4–227
Bartlett, G. S., 12.4–254
Bartman, F. L., 12D–157, –163, –184, –191, –198, –204, –206
Bartnicki, L. (*ed.*), 12.4–43
Bates, D. R., 12.4–1, 12D–4, –13, –58, –59
Bauer, J. R., 12D–106
Beelitz, P., 12D–10
Berenbeim, D. Ia., 12.4–283
Beson, E. E., 12.4–2
Best, A. C., 12.4–337, –338
Beth, E. W., 12D–31, –117, –142
Bhattacharya, P. K., 12D–28
Bigg, E. K., 12D–158
Blamont, J., 12.4–2, 12D–60
Blinova, E. N., 12.4–224
Blood, R. D., 12.4–302
Bobrov, M. S., 12.4–154
Böer, W., 12.4–88
Böhm, K. H., 12D–61
Börnstein R., 12D–15
Boggess, R. L., 12D–183
Boldizsár, T., 12.4–175
Bol'shakov, V. S., 12.4–178
Booker, H. G., 12.4–1, –139
Borel, G., 12.4–203
Borisov, A. A., 12.4–9
Bowen, P., 12D–200
Boyd, R. L. F., 12D–4, –11, –62, –200
Bratu, C., 12.4–87
Brewer, R. D., 12.4–240
Briscoe, H. W., 12.4–130
Brogan, L., 12D–139, –148
Brown, R. R., 12.4–100
Brunnschweiler, D. H., 12.4–312
Bryson, R. A., 12.4–320
Bukin, G. V., 12.4–146
Bullen, K. E., 12.4–174
Bulletin de Madagascar, 12.4–239
Burgess, E., 12D–8
Burns, G. A., 12D–187
Bushnell, Vivian C., 12D–133, 12D–147
Buwalda, Phyllis, 12.4–103
Byers, H. R., 12D–13

Cadle, R. D., 12.4–214
Calábek, V., 12.4–278
California Institute of Technology, 12D–28
California Univ. Institute of Geophysics, 12.4–144, 12D–5
California Univ., Los Anglels, Dept. of Meteorology, 12.4–263
Camargo, F. C., 12.4–313
Campbell, W. H., 12.4–153
Cantlon, J. E., 12.4–19
Carl, F. E., 12.4–79
Carr, T. R., 12D–203
Carreras, R., 12.4–233
Chadwick, P., 12.4–176
Chalonge, D., 12D–20
Chamberlain, J. W., 12D–13
Champion, K. S. W., 1D–33,2 –36
Chaney, L. W., 12D–157
Chao, Jih-ping, 12.4–236
Chapman, D. R., 12.4–111
Chapman, S., 12.4–1, 12D–28, –118
Chapygina, N. M., 12.4–209
Charles, B. N., 12D–32
Checha, V. A., 12.4–132
Chekirda, A. T., 12.4–105
Cheng, K. T. C., 12.4–316
Cherednichenko, V. I., 12.4–248
Chinburg, D. L., 12.4–155
Chirakadze, G. I., 12.4–273
Chiu, Wan-cheng, 12D–28
Christensen, W. I., 12.4–320
Chudakov, A. E., 12.4–56, –57
Coates, R. J., 12.4–113
Coen, P. E., 12.4–291
Cole, A. E., 12D–33, –201

Condron, T. P., 12D–38
Conover, J. H., 12.4–274
Conover, W. C., 12D–146
Contract AF 19(122)-44, 12D–50
Contract AF 19(122)-55, 12D–27
Contract AF 19(122)-252, 12D–139
Contract AF 19(122)-642, 12.4–349, –350
Contract AF 19(604)-108, 12D–114
Contract AF 19(604)-111, 12D–5
Contract AF 19(604)-545, 12D–24
Contract AF 19(604)-999, 12D–194
Contract AF 19(604)-1006, 12D–153
Contract AF 19(604)-1304, 12.4–145, 12D–179
Contract AF 19(604)-1499, 12.4–244
Contract AF 19(604)-1871, 12D–169
Contract AF 19(604)-2188, 12.4–61
Contract AF 19(604)-2424, 12.4–263
Contract AF 19(604)-5191, 12.4–320
Contract AF 19(604)-5743, 12.4–242
Contract AF 61(514)-561-C, 12.4–246
Contract DA-36-039 Sc-34, 12D–28
Contract DA-36-039 Sc-15443, 12D–140
Contract DA-36-039 Sc-64659, 12D–191, –204
Contract DA-36-039 Sc-71137, 12.4–18
Contract DA-36-039 Sc-74903, 12.4–139
Contract DA-36-039 Sc-84516, 12D–202
Contract Nonr-1656(00),12.4–2
Contract W19-122-ac19, 12.4–144
Contract W-33-038 Sc-15050, 12D–100
Contract W-36-039 Sc-32307, 12D–101
Copp, M. R., 12.4–49
Cordes, Ch., 12.4–78
Cornell Univ. School of Electrical Engineering, 12.4–139
Cox, E. F., 12D–91, –92
Craig, R. A., 12D–107
Crain, C. M., 12.4–63
Crary, A. P., 12.4–20, 12D–29, –96, –119, –127, –133, –147
Crone, W. R., 12.4–117
Cronin, J. G., 12.4–50
Crow, L. W., 12.4–89

Danjon, A., 12.4–37, 12D–13
D'Arcy, R. G., 12.4–100
Darling, E. M., Jr., 12D–201
De Marrais, G. A., 12.4–98
Demianczuk, P. P., 12.4–51, 12D–63
Denver Univ. Denver Research Institute, 12D–139
Dessler, Z. J., 12.4–147, –157
de Vaucouleurs, G. H., 12.4–2
Diaz, E. L., 12.4–322
Dingle, A. N., 12.4–77
Dinkelacker, O., 12.4–228
Dobosi, Z., 12.4–277
Dobson, G. M. B., 12D–84
Dogniaux, R., 12.4–26
Donn, W. L., 12.4–310
Dorporto, M., 12.4–85
Dow, W. G., 12D–27, –31, –144
Doyen, Paulette, 12.4–25
Drouet, F., 12.4–282
Dubin, M., 12D–142
Duckert, P., 12D–87
Duffus, H. J., 12.4–148
Dufour, L., 12.4–202
Duke, P. J., 12.4–121
Duncan, R. A., 12.4–358
Dyer, D. O., 12.4–153
Dzhemilev, G. G., 12.4–133

Eckart, C., 12.4–221
Edinger, J. G., 12.4–263
Egorova, V. I., 12.4–210
Ehler, W. L., 12.4–82
Ellerböck, W., 12.4–99
Elliott, M. J. W., 12.4–201
Elterman, L., 12D–108, –128, –134, –135
Enemark, D. C., 12.4–124
Engel, J. N., 12.4–49
Erofeev, N. M., 12.4–133
Ewing, M., 12.4–310
Expédition Antarctique Belge 1957/1958, 12.4–26

Fàntoli, A., 12.4–298
Farnham, D. L., 12.4–275
Faust, H., 12.4–237
Feĭgel'son, E. M., 12.4–13
Fejer, J. A., 12.4–138
Fel'dman, Ia. I., 12.4–295
Ference, M., Jr., 12D–159
Ferreira, H. A., 12.4–222
Fesenkov, V. G., 12.4–161, –162
Fielder, E. C., 12.4–338
Filippova, A. K., 12.4–290
Finsterwalder, R., 12.4–181
Fishback, F. F., 12D–177
Flohn, H., 12.4–237, 12D–160
Folkhart, B. M., 12D–41
Fox, D. F., 12D–207
Francis, W. E., 12.4–147
Freethey, F. E., 12.4–262
Freier, G. D., 12.4–107
Friedland, S. S., 12D–161
Friedman, H., 12.4–1
Friedrich, W. (*ed.*), 12.4–31
Fritsch, V., 12.4–354
Fritschen, L. J., 12.4–195
Fuchs, F., 12.4–76
Fuglister, F. C., 12.4–16
Funk, J. P., 12.4–196
Fuss, F., 12.4–69

Gäbler, H., 12.4–339
Gardner, F. F., 12D–113
Garland, G. D., 12.4–163
Gast, Th., 12.4–93
Gates, D. M., 12.4–2
Georg, J. G., 12.4–356
Georgescu, P., 12.4–87
Gerdel, R. W., 12.4–282
Gerson, N. C., 12D–64, –65
Gill, G. C., 12.4–77
Giordano, A., 12.4–74, –75
Glazova, K. S., 12.4–13
Gouguel, J., 12.4–167
Gold, L. W., 12.4–258, –259
Goldberg, L., 12D–13
Goldberg, P., 12.4–144
Gol'din, B. M., 12.4–288
Goldsmith, P., 12.4–201
Goody, R. M., 12D–12
Gordon, S., 12.4–344
Gouch, J., Jr., (*transl.*), 12D–168
Grandmontagne, R., 12D–120, –129
Green, F. W., 12.4–328
Green, H. S., 12.4–347
Green, M. I., 12.4–147
Green, R., 12.4–166
Greenhow, J. S., 12.4–1
Griffith, R. M., 12D–186
Grimes, Annie E. (*comp.*), 12.4–46
Grimm, H., 12.4–73
Grimminger, G., 12D–30, –66
Groves, G. V., 12D–162, –200
Gruzdev, D. M., 12.4–326
Gubin, V. I., 12.4–8
Gural'nik, I. I., 12.4–10
Gutenberg, B., 12D–86, –88, –90, –109
Guttmacher, Ilene, 12D–22

Haake, G. R., 12.4–42
Hader, F., 12.4–92
Haley, A. G., 12.4–64
Hall, W. F., 12.4–240
Hame, T. G., 12D–202

Hannell, F. G., 12.4-249
Harnack, K., 12.4-72
Harris, D. L., 12.4–232
Harris, I., 12D–34
Harrison, H. T., 12.4–47
Hart, P. J., 12D–22
Harvard College Observatory, 12D–48
Haskell, N. A., 12D–97
Haupt. H., 12.4–99
Haurwitz, B., 12D–89
Havens, R. J., 12D–67
Heikkila, W. J., 12D–21
Hentschel, G., 12.4–71, –76
Herrinck, P., 12.4–143
Hess, V. F., 12.4–119
Hesse, F., 12.4–70
Hesselberg, Th., 12.4–307
Hewson, E. W., 12.4–77
Hey, J. S., 12D–136
Hildreth, R. J., 12.4–302
Hofman, G., 12.4–271
Hoinkes, H., 12.4–21
Holliday, C. T., 12D–13
Holzer, R. E., 12.4–144
Horacek, V., 12.4—333
Horner, F., 12.4–114
Horowitz, R., 12D–72
Houk, R. J., 12.4–292
Howells, I. D., 12.4–131
Hubert, W. E., 12D–203
Hulbert, E. O., 12D–68
Hutchins, C. W., 12.4–320
Hutchinson, G. E., 12D–13

Imai, I., 12.4–280
Ingraham, R. L., 12.4–149
Innes-Taylor, A., (*ed. & Comp.*), 12.4–17
Institute of the Aeronautical Sciences, 12,4–2
International Geophysical Year, 1957/1958, 12.4–24
Iroshnikov, A. I., 12.4–327
Isaev, E. A., 12.4–14
Ishikawa, G., 12.4–102, –353
Isimaru, Yukiti, 12D–69
Israel Meteorological Service, 12.4–299
Istomin, V. G., 12.4–55
Ivanov, B. N., 12.4–288
Izakov, M. N., 12D–172

Jacchia, L. G., 12D–49
Jacobs, J. A., 12.4–148, –152, –177
Jacobs, J. M., 12.4–86
Jacobs, M. B., 12.4–4
Jackson, J. E., 12.4–129
Jaffé, A., 12.4–182
Jaggar, T. A., 12.4–169
Janes, H. B., 12.4–262
Japan Central Meteorological Observatory, 12D–25
Japan Meteorological Agency, 12.4–297
Jastrow, R., 12.4–52, 12D–34
Jelley, J. V., 12.4–201
Johannessen, T. W., 12.4–307
Johnson, F. S., 12D–130, –137
Jolivet, J., 12.4–170
Jones, Sir H. S., 12D–8
Jones, L. M., 12D–101, –140, –157, –163, –177, –188, –189, –204
Jordan, C. L., 12.4–266
Jumkis, A. R., 12.4–260
Junge, C., 12.4–269
Jungmann, H., 12.4–325
Jurčec, V., 12.4–190

Kaiser, T. R., 12D–138
Kalecsnnik, S. V., 12.4–41
Kalinovskiĭ, A. B., 12D–17
Kallmann, H. K., 12D–5, –35, –37, –44
Kanaya, Sumio, 12.4–335
Kao, Shih-Kung, 12.4–263
Kapur, A. P., 12.4–317
Katzenstein, J., 12D–161
Kellogg, W. W., 12D–5, –23, –45, –53, –121, –164
Kellogg, P. J., 12.4–126, –158
Kelley, J. J., 12D–7
Kennedy, W. B., 12D–133, –139, –148
Keppler, E., 12.4–345
Kern, H., 12.4–287
Khazova, O. N., 12.4–209
Khrgian, A. K., 12D–3
Khvostikov, I. A., 12D–174
Kimpara, Atsushi, 12.4–353
King, R. F., 12.4–183
King, W. J. (*transl.*), 12.4–247
Kitaoka, Tatsumi, 12.4–106, 12D–70
Kittinger, J., 12.4–2
Kizawa, T., 12.4–171
Kleinschmidt, E., 12.4–40
Knoche, W., 12D–83
Kochkarev, G. N., 12.4–283
Kölzer, J., 12D–110
Kogan, S. Ia., 12.4–13
Kokin, G. A., 12D–172
Koll, R. T., 12D–67
Kondrat'ev, K. Ia., 12D–71
Kopal, Z., 12D–49
Korol'kov, D. V., 12.4–115
Koronatov, T. D., 12.4–13
Korotkevich, E. S., 12.4–28
Koster, J. R., 12.4–116
Koteswaram, P., 12D–111
Kraft, L. G., 12.4–130
Krauthammer, H., 12.4–299
Kraus, J. D., 12.4–117
Krenek, L. O., 12.4–281
Krieger, F. J., 12.4–54
Kubo, J., 12.4–251
Kuhn, P. M., 12.4–195
Kuiper, G. P., (*ed.*), 12D–13
Kuznetsova, M. A., 12.4–13

LaGow, H. E., 12D–67, –72, –165, –207
Lambor, J., 12.4–289
Landauer, J. K., 12.4–184
Landolt, H. H., 12D–15
Landsberg, H. E., 12.4–308
Lange, A. H., 12.4–82
Larson, K. H., 12.4–82
Lassettre, E. N., 12.4–349, –350
Latour, J. H. M., 12.4–285
Laudelout, H., 12.4–319
Lauer, W., 12.4–293
Lebedev, A., 12.4–11
Ledkhovich, A. A., 12.4–7
Ley, W., 12D–54
Leyton, L., 12.4–328
Liao, S., 12.4–280
Liemohn, H., 12.4–359
Lindemann, F. A., 12D–84
Linder, W. J., 12D–187
Link, F., 12D–6, –98
Lippos, F. W., 12.4–60
List, R. J. (*comp.*), 12D–18
Little, G. G., 12.4–18
Liu, V. C., 12D–157, –191
Lobdell, H. L., 12.4–260
Lönnqvist, O., 12D–73
Loeser, R. (*transl.*), 12D–168
Logachev. Iu. I., 12.4–56, –57
Long, I. F., 12.4–272
Lovell, A. C. B., 12.4–1, –159
Lovell, C. W. Jr., 12.4–261
Lowenthal, M. J., 12D–149, –150, –173, –178, –190
Lundquist, C. A., 12.4–59
Lyon, A. J., 12.4–141

Macdonald, G. A., 12.4–169
McCracken, K. G., 12.4–125
McCready, L. L., 12D–113
McCreary, F. E., Jr., 12.4–300
McLarren, R., 12D–93
McNamara, A. C., 12.4–356
Madagascar Service Météorologique, 12.4–238
Maeda, Hiroshi, 12.4–156
Maere d'Aertrycke, X. de, 12.4–26
Magin, G. B., Jr., 12.4–44
Makeev, P. S., 12.4–311
Malkevich, M. S., 12.4–13
Mamikonova, S. V., 12.4–10
Mange, P. W., 12.4–145, 12D–50
Mantis, H. T., 12.4–2
Mashkovich, S. A., 12.4–225
Massey, H. S. W., 12.4–53, 12D–4, –11
Masterson, J. E., 12D–203
Mathiesen, O., 12.4–122

Mathur, L. S., 12D–99
Mateev, L. T., 12.4–223
Meador, W. E., Jr., 12.4–351
Mehra, N. C., 12.4–186
Meinel, A. B., 12D–13
Menzel, R. G., 12.4–286
Meyer, J., 12.4–319
Michel, H., 12.4–343
Michigan Univ. Engineering Research Inst., 12D–24, –27, –100, –140, –169, –191, –194, –204
Michigan Univ. Signal Corps Upper Atmosphere Research Project, 12D–141
Michon, M. G., 12.4–83
Mickelwait, A. B., 12.4–59
Miknevich, V. V., 12D–174, –175
Mikirov, A. E., 12.4–216, –342
Minzner, R. A., 12D–36, –38, –42, –142
Mitra, S. K., 12D–16, –74, –75
Miura, Akira, 12.4–270
Miyazaki, M., 12.4–294
Monteith, J. L., 12.4–272
Mordukhovich, M. I., 12D–192
Morgan, M. G., 12.4–1
Morozov, V. M., 12D–166
Murakami, Tadayoshi, 12.4–110
Murgatroyd, R. J., 12D–151
Murgatroyd, R. L., 12D–176
Musselian, Sh. A., 12.4–323

Nakai, Taketosi, 12.4–193
Nakamura, S., 12D–70
Nasmyth, P. W., 12.4–148
Neugebauer, Marcia, 12.4–103
Nazarek, A., 12D–102
Neill, H. W., 12D–101
Neužil, L., 12D–6
New Mexico State Univ., 12.4–61
N. Y. Univ. College of Engineering, Research Div., 12D–153
Newell, H. E., Jr., 12.4–1, 12D–14, –76, –112, –193
Newkirk, G. A., Jr., 12.4–2, 12D–149
Ney, E. P., 12.4–334
Nichols, B., 12.4–139
Nicolet, M., 12.4–1, 12D–13, –50, –77, –179
Nikolaev, A. G., 12.4–57
Nikol'skiĭ, G. M., 12.4–245, –248
Nolan, G. F., 12.4–226
Nordberg, W., 12D–170, –184, –186, –198, –206
Nupen, W., 12.4–45
Ogden, D. E., 12D–205
Ohio State Univ. Research Foundation, 12.4–349, –350
Oi, Masamichi, 12.4–324
Onwumechilli, C. A., 12.4–150
Opik, E. J., 12.4–104, 12D–152
Orlova, E. M., 12.4–219
Oslo Universitet. Institute of Theoretical Astrophysics, 12.4–246
Oswalt, W. H., 12.4–304
Otterman, J., 12D–180, –184, –191
Otto, W., 12.4–318
Owren, L., 12.4–18
Ozmidov, R. V., 12.4–267

Paetzold, H-K, 12D–167, –168
Palmeira, R. A. R., 12.4–125
Pant, P. S., 12D–153
Panzarini, R., 12.4–23
Pápai, G., 12.4–211
Parker, M. J., 12D–195
Parthasarathy, R., 12.4–118
Pašić, H., 12.4–191
Pasquill, F., 12.4–231
Pawsey, J. L., 12D–113
Peake, W. H., 12D–202
Pearce, D. C., 12.4–259
Péczely, G., 12.4–217
Peeters, A., 12.4–319
Peixoto, J. P., 12.4–222
Penndorf, R., 12.4–242, 12D–15, –78
Pennsylvania State College Ionosphere Research Lab., 12.4–145, 12D–50, –179
Perelygin, V. P., 12.4–133
Peterson, J. W., 12D–169, –177, –189, –194
Petinov, V. P., 12.4–133
Petukhov, V. A., 12.4–247
Phillips, G. J., 12.4–135
Pícha, J., 12.4–241
Pickering, W. H., 12.4–65, 12D–28
Pidoplichko, I., 12.4–311
Pierce, A. K., 12.4–243
Pierce, E. T., 12.4–346
Pierce, L. T., 12.4–257
Piggott, W. R., 140
Pineo, V. C., 12.4–130
Pinus, N. Z., 12D–17, –79
Pippan, Therese, 12.4–32
Plass, G. N., 12D–103
Pogosian, K. P., 12.4–5
Pokrovskaia, T. V., 12.4–33, –250
Poland Państwowy Instytut Hydrologiczno-Meteorologiczny, 12.4–43
Poliakova, E. A., 12.4–35
Polkovnikov, M. A., 12.4–10
Pond, H. L., 12D–33, –36
Ponomarev, E. A., 12.4–248
Pope, J. H., 12.4–153
Porfir'ev, I. F., 12.4–207
Porter, Elizabeth M., 12.4–213
Portig, W. H., 12.4–331
Potsius, V. Iu., 12.4–84
Potter, P. B., 12.4–64
Pozdniakova, V. A., 12.4–206
Press, F., 12.4–103
Pressman, J., 12D–154, –155
Price, W. C., 12D–118
Priroda, 12.4–27, –284
Project DA 3-99-07-22, 12D–140
Project SC 172B, 12D–140
Pshenaĭ-Severin, S. V., 12.4–268

Raff, S., 12D–195
Rakipova, L. R., 12.4–229
Randall, Lois E., 12.4–44
Ratcliffe, J. A., 12.4–1, 12D–1
Ratner, B., 12.4–321
Reed, J. W., 12D–196
Regel, C. von, 12.4–305
Regula, H., 12D–94, –143
Regula, W., 12D–95
Reid, W. H., 12.4–232
Reifman, A., 12D–31
Reissig, Gisela, 12.4–318
Reiter, R., 12.4–80
Reynolds, G., 12.4–187
Richardson, J. M., 12D–51
Richter, E., 12D–61
Ripley, W. S., 12D–38, –42, –181
Roberts, H. E., 12D–55
Roberts, W. O., 12.4–2
Robinson, A., 12.4–179
Romney, E. M., 12.4–82
Rosini, E., 12.4–329
Ross, M. D., 12.4–2
Royal Society of London. Gassiot Committee, 12D–11
Rubin, M. J., 12.4–252, –253
Rudloff, W., 12.4–188
Russell, J. A., 12.4–90

Sadler, J. C., 12.4–274
Sänger, R., 12.4–233
Saito, R., 12.4–294
Sandakova, Ie. V., 12.4–341
Savarenskiĭ, E. F., 12.4–36
Saxton, J. A., 12.4–192
Schaefer, E. J., 12D–189, –194
Scherag, R., 12D–122, –123, –197
Schilling, G. F., 12D–5, –41, –53
Schmid, H., 12.4–59
Scholte, J. G. J., 12.4–172
Schorsch, J. F., 12D–187
Schrag, R. L., 12.4–134
Schubart, J., 12.4–109

Schulte, H. F., 12D–187, –189, –194
Schweitzer, H., 12.4–34
Science, 12.4–21, –81
Seamon, L. H., 12.4–254
Seaton, J. J., 12D–11
Seilkopf, H., 12.4–40, –66
Semenov, V. G., 12.4–12
Sementsova, A. R., 12.4–332
Setty, C. S. G. K., 12.4–108
Shand, J. A., 12.4–148
Sheffield, A. H., (*comp.*), 12.4–24
Shephard, R. J., 12.4–218
Shimizu, Tôro, 12.4–348
Shinn, D. H., 12.4–136
Shklovskiĭ, I. S., 12.4–62
Shul'gin, A. M., 12.4–314
Shvidkovskiĭ, E. G., 12D–80, –182
Sible, N. J., 12D–148
Sicinski, H. S., 12D–144
Sik, A. E., 12.4–67
Singer, S. F., 12.4–104
Sinha, K. L., 12.4–279
Sissenwine, N., 12D–42, –43
Sliadnev, A. P., 12.4–295
Slobodov, B. Ia., 12.4–208
Smith, C. P., Jr., 12D–26
Smith, H., 12.4–95
Smith, J. R., 12.4–2
Smith, M. E., 12.4–200
Smith, P. G., 12D–136
Smith, R. J., 12.4–86
Smithsonian Institution, 12D–18
Snavely, B. L., 12D–195
Soboleva, N. S., 12.4–115
Sorkina, A. I., 12.4–303
Sparrow, G. W. A., 12.4–276
Spencer, N. W., 12D–24, –27, –100, –144, –183
Spinnanger, G., 12.4–336
Spiridonova, Iu. V., 12.4–212
Stechow, E., 12.4–306
Steele, H. L., 12D–187
Steinhauser, F., 12.4–204, –215
Stephens, E. D., 12D–52
Sterne, T. E., 12D–40, –41
Steru, M., 12.4–96
Stewart, S. W., 12.4–164
Stommel, H., 12.4–179
Strong, J., 12D–103
Stroud, W. G., 12D–156, –159, –170, –184, –186, –198, –206
Styra, B., 12.4–220
Sukhotskiĭ, E. I., 12D–39
Subramanian, A., 12.4–352
Suda, Ken, 12.4–330
Sulzberger, P. H., 12.4–97
Suomi, V. E., 12.4–195
Sutton, Sir O. G., 12D–207
Suzuki, Y., 12.4–193
Sverdrup, H. U., 12D–13
Swarup, G., 12.4–118
Swerling, P., 12.4–63
Swinton, D. B., 12D–205

Taeusch, D., 12D–183
Tamm, Olof F. S., 12.4–296
Tandon, A. N., 12.4–173
Tauber, G. M., 12.4–29
Tedrow, J. C. F., 12.4–19
Tepley, L., 12.4–144
Terhune., E. A., 12D–156
Thompson, M. C., Jr., 12.4–262
Thomson, A., 12.4–255
Thran, P., 12.4–315
Thuronyi, G., 12.4–45
Titus, P., 12D–184, –198, –206
Townsend, J. W., Jr., 12D–193
Trautmann, E., 12.4–240
Tschirhart, G., 12.4–265
Tsyganov, G. P., 12.4–38
Turner, K. A., 12.4–260
Twomey, S., 12.4–189

Ueno, Kiyoshi, 12.4–335
U. S. Argicultural Research Service, 12.4–94
U. S. Air Force. Geophysics Research Directorate, 12D–38
U. S. Army Ballistic Missile Agency, Redstone Arsenal, 12D–185
U. S. Army Map Service, 12.4–165
U. S. Army Snow Ice and Permafrost Research Establishment, 12.4–282
U. S. Atomic Energy Commission, 12.4–86
U. S. Forest Service Intermountain Forest and Range Experiment Station, Missoula, Montana, 12.4–199
U. S. Hydrographic Office, 12.4–22
U. S. Office of Naval Research, 12D–47
U. S. Weather Bureau, 12D–28
Upper Atmosphere Rocket Research Panel (U. S.), 12D–11

Vaeth, J. G., 12D–7
Vakulov, P. V., 12.4–56, –57
Van Allen, J. A., 12.4–160
van Wijk, W. R., 12.4–195
Vassy, A., 12D–131, –208
Vassey, É., 12D–2, –46, –131
Venner, J. H., 12D–156
Verhaeghe, M., 12.4–168
Verma, S. D., 12.4–352
Vernov, S. N., 12.4–56, –57
Vestine, E. H., 12.4–1
Vichney, N., 12.4–58
Virginia Polytechnic Institute. Agronomy Dept., 12.4–15
Vitro Laboratories, Silver Spring, Md., 12.4–2
Volz, F., 12.4–197, –198
von Humboldt, A., 12.4–41
Vonnegut, B., 12.4–2
Voress, H. E., 12.4–86
Vorob'ev, V. D., 12.4–6
Vsekhsviatskiĭ, S. K., 12.4–248

Wachter, H., 12.4–230
Wagner, W. J., Jr., 12.4–77
Waldeskog, B., 12.4–122
Walsh, J. R., 12D–156, –159, –170
Walther, S., 12.4–299
Wares, G. W., 12D–33
Warfield, G. N., 12D–56
Wark, D. Q., 12D–210
Weekes, K., 12.4–1, 12D–81
Weiland, S., 12D–156
Weisner, A. G., 12D–145, –159
Weiss, A. A., 12.4–112
Wentzien, C. J., 12D–146
Wenzel, E. A., 12D–191
Wescott, E. M., 12.4–153
Wetter und Leben, 12.4–119
Wexler, H., 12.4–185, 12D–43, –104
Whale, H. A., 12.4–357
Whipple, F. J. W., 12D–85
Whipple, F. L., 12.4–59, 12D–13, –82, –105, –124
White, E. R., 12.4–350
White, R. M., 12.4–226
Whiting, Georgia C., 12.4–68
Wiebrock, H., 12D–199
Wilkes, M. V., 12D–125
Wilkie, W. J., 12D–191
Wilson, A. T., 12.4–180
Wisconsin Univ. Dept. of Meteorology, 12.4–320
World Meteorological Organization, 12.4–39
Wright, C. S., 12.4–148
Wright, R. W., 12.4–116

Yagoda, H., 12.4–2
Yamamoto, M., 12.4–156
Yanagisawa, Z., 12.4–280
Yokoyama, Izumi, 12.4–151
Yoshino, M., 12.4–264

Zaĭtsev, V. A., 12.4–7
Zatzick, M. R., 12D–161
Zavarina, M. V., 12D–9, –19
Zbrozek, J. K., 12.4–48
Zelenkov, V. Ie., 12.4–132
Zhdanov, G. B., 12.4–120
Ziabrikov, V. A., 12.4–223
Zilus, V., 12.4–38
Zimmerschied, W., 12.4–301

INDEX OF SUBJECTS

Acclimatization, 12.4–76
Acoustical phenomena, 12D–94, 12D–96, 12D–97
Acoustical propagation, 12D–109
Acoustical sounding data, 12D–29, 12D–51, 12D–56, 12D–90, 12D–116, 12D–119, 12D–127, 12D–133, 12D–139, 12D–147, 12D–151, 12D–156, 12D–180, 12D–196
Acoustical temperature determination, 12D–192
Acoustical upper wind measurement, 12D–148
Adiabatic charts, 12.4–190
Advances in geophysics, 12D–65, 12D–124
Aerial photogrammetry, 12.4–181
Aerobee rocket firings, 12D–156, 12D–186, 12D 198
Aerologic conditions, 12.4–265
Aerological synoptics, 12.4–34
Aerology textbooks, 12D–17
Aerometerography, 12.4–7
Aeronautical weather forecasting, 12.4–38
Aeronautics, 12D–55
Aeronomy textbooks, 12D–8
Aerosol content of atmosphere, 12.4–269
Aerosol identification, 12.4–214
Aerosol particle spectrum, 12.4–216
Aerosol research, 12.4–34
Aerosol scattering, 12.4–242
Ageostrophic winds, 12.4–194
Agricultural meteoroligy, 12.4–30
Air-borne instrumentation textbooks, 12.4–7
Air current measurements, 12.4–217
Air density, 12D–117
Air density calculations, 12D–41
Air density measurement techniques, 12D–106, 12D–187
Air-earth current measurement techniques, 12.4–205
Air layers near the ground, 12.4 -33
Air mass classification, 12.4–331
Air mass climatology, 12.4–331, 12.4–332
Air sampling and analysis, 12D–140
Airplane cloud physics measurement textbooks, 12.4–7
Airport visibility, 12.4–337, 12.4–338
Albedo measurements, 12.4–182
Albedo of glaciers, 12.4–182
α radiography, 12.4–84
Altitude effects on tuberculosis patients, 12.4–325
Anemometers, 12.4–199
Angular momentum transfer, 12.4–229
Animal distribution, 12.4–306
Anisotropic scattering, 12.4–13
Annual meriodional circulation, 12.4–224
Annual temperature variations, 12D–104
Annular solar eclipse, April 19, 1958, 12.4–335
Anomalous sound propagation, 12D–29, 12D–85, 12D–86, 12D–92, 12D–96
Antarctic climatology, 12.4–21
Antarctic expeditions, 12.4–23
Antarctic ionosphere, 12.4–146
Antarctic meteorology research stations, 12.4–27
Antarctic radio communication, 12.4–24
Antarctic research expeditions, 12.4–28
Antarctic research programs, 12.4–20
Applied meteorollgy, 12.4–30 88
ARCAS rockets, 12D-203
Architectural climatology, 12.4-88
Arctic air circulation, 12.4–212
Arctic air routes, 12.4–17
Arctic research, 12D–198
Arctic survival guides, 12.4–17
ARDC Model Atmosphere, 12D–36, 12D–42
Artificial asteroids, 12.4–63
Asteroid-borne transponding equipment, 12.4–63
Asteroid disintegration, 12.4–162
Astronautics, 12.4–3
Astronautics research and development, 12.4–54
Atlantic Ocean influence on European weather, 12.4–12
Atmospheric acoustics, 12D–99
Atmospheric circulation, 12.4–29, 12.4–229
Atmospheric circulation models 12.4–225
Atmospheric composition, 12D–37, 12D–59, 12D–65
Atmospheric density, 12D–11,4 12D–115
Atmospheric diffusion, 12.4–231
Atmospheric diffusion studies, 12.4–233
Atmospheric electricity, 12.4–346
Atmospheric models, 12.4–221, 12D–15, 12D–18, 12D–19, 12D–34, 12D–35, 12D–37, 12D–38, 12D–41, 12D–45, 12D–83
Atmospheric nomenclature, 12D–63, 12D–160
Atmospheric physics textbooks, 12D–2, 12D–3
Atmospheric pollution, 12.4-4, 12.4–231, 12D–98
Atmospheric pollution control, 12.4–93
Atmospheric pollution measurement techniques, 12.4–204
Atmospheric pollution variations, 12.4–218
Atmospheric pollution-weather relationships, 12.4–204, 12.4–217
Atmospheric radiation measurements, 12D–210
Atmospheric refraction, 12.4–192, 12.4–344
Atmospheric structure, 12D–19, 12D–30, 12D–45, 12D–55, 12D–57, 12D–59, 12D–63–12D–65, 12D–67, 12D–69
Atmospheric thermodynamics, 12D–198
Atmospheric turbulence, 12.4–252
Atomic interactions, 12.4–351
Audibility zones, 12D–85, 12D–89, 12D–94, 12D–97, 12D–110
Auroral arcs, 12.4–153
Auroral echo distribution, 12.4–356
Auroral effects on radio wave propagation, 12.4–18
Auroral hydrogen lines, 12.4–355
Auroral polarization, 12.4–358
Auroral zones, 12.4–357
Auroras, 12.4–359, 12D-2, 12D–64, 12D–68

Baroclinic disturbances, 12.4–236
Baroclinicity, 12.4–208

Bibliography of climatic maps, 12.4–46
Bibliography on agricultural meteorology, 12.4–43
Bibliography on forest meteorology, 12.4–43
Bioclimatology, 12.4–78, 12.4–79
Biography of Alexander von Humboldt, 12.4–41
Biological cycles, 12.4–83

Carbon dioxide, 12D–58
Carbon dioxide in the stratosphere, 12.4–201
Careers in meteorology, 12.4–89
Centers of action, 12.4–208
Chemical analysis of air pollutants, 12.4–4
Chemical composition of cosmic rays, 12.4–122
Chemical composition of upper atmosphere, 12D–50
Chemical microscopy, 12.4–214
Chemical micrurgy, 12.4–214
Cherry trees, 12.4–69
Chronometry, 12.4–60
Circulation characteristics, 12.4–234
Circulation type catalogs, 12.4–14
Circulation types, 12.4–210
Cirrus forecasting, 12.4–275
City planning, 12.4–88
Climate and economic development, 12.4–292
Climate of Altai Region, 12.4–295
Climate of Antarctica, 12.4–29
Climate of Argentina, 12.4–322
Climate of Central America, 12.4–293
Climate of Ethiopia, 12.4–298
Climate of Iberian Peninsula, 12.4–301
Climate of Japan, 12.4–294, 12.4–297
Climate of Johnston Island, 12.4–300
Climate of National Reactor Testing Station, Idaho, 12.4–98
Climate of Queen Maud Land, 12.4–25
Climate of southeast Sweden, 12.4–296
Climate of U.S.S.R., 12.4–9
Climatic analysis, 12.4–314
Climatic change effects on animal distribution, 12.4–306
Climatic changes, 12.4–183
Climatic classification, 12.4–312
Climatic data, 12.4–15, 12.4–98, 12.4–297
Climatic data presentation, 12.4–186
Climatic fields, 12.4–225
Climatic probabilities for European U.S.S.R., 12.4–11
Climatic probability nomograms, 12.4–11
Climatic statistics, 12.4–11
Climatic variability in arid regions, 12.4–316
Climatic variations, 12.4–305, 12.4–307, 12.4–308
Climatic zones, 12.4–311
Climatic zones of Costa Rica, 12.4–291
Climatological methodology, 12.4–39
Climatology of Africa, 12.4–30
Climatology textbooks, 12.4–9
Climatotherapy, 12.4–70, 12.4–72, 12.4–73, 12.4–76
Cloud formation, 12.4–228
Cloud height, 12.4–51
Cloud nuclei, 12.4–189
Cloud photographs from satellites, 12.4–274
Cloud physics, 12.4–189
Cloud physics measurement textbooks, 12.4–7
Cloud systems, 12.4–277
Cloudiness analysis, 12.4–234
Cloudiness classification, 12.4–277
Cloudiness data, 12.4–278
Coefficient of internal friction, 12.4–227
Cold air invasions, 12.4–330
Cold effects on man, 12.4–17
Colloidal spheres, 12.4–242
Compendium articles, 12D–74, 12D–107, 12D–109, 12D–112
Condensation heat energy, 12.4–230
Condensation nuclei density, 12.4–269
Conservation practices, 12.4–326
Constant level balloon data, 12.4–194
Continentality, 12.4–322
Contingency tables, 12.4–186
Conversion tables, 12D–47
Cooling of the earth, 12.4–177
Cooperative ocean weather observation, 12.4–68
Coronograph observations, 12.4–248
Corpuscular emissions from sun, 12.4–245
Corpuscular radiation, 12.4–154
Corpuscular streams, 12.4–355
Cosmic influences on weather, 12.4–334
Cosmic radtiiaon, 12.4–160, 12D–8
Cosmic ray alpha particles, 12.4–121
Cosmic ray balloon research, 12.4–123
Cosmic ray conferences, 12.4–120
Cosmic ray data, 12.4–56
Cosmic ray discovery, 12.4–11
Cosmic ray intensities, 12.4–123
Cosmic ray nucleon distribution, 12.4–122
Cosmic ray trajectories, 12.4–126
Cosmology, 12.4–159
Cryoconite holes, 12.4–282
Cyclone damage reports, 12.4–239

Delta-function model, 12.4–34
Dendrochronology, 12.4–304
Density gradients, 12D–61, 12D–185
Density variations, 12D–32
Desert research, 12.4–316
Design data for cooling systems, 12.4–91
Dew formation, 12.4–272
Dew Measurement techniques, 12.4–271
Diffusion by droplets, 12.4–34
Diffusion equations, 12.4–14
Dirt cone formation, 12.4–28
Dissociation, 12D–31
Dissociation effects on stratospheric temperature, 12D–4
Diurnal pressure variations, 12D–125
Dinural temperature variations, 12D–104, 12D–155
Drop velocities, 12.4–268
Drought resistant plants, 12.4–316
Dry bulb temperature ranges, 12.4–186
Dynamic climatology, 12.4–329, 12.4–330
Dynamic meteorology textbooks, 12.4–8

E region, 12.4–134
Earth as a planet, 12D–13
Earth's core temperature, 12.4–174
Earth's core theories, 12.4–174
Earth's electric field, 12.4–107
Earth's interior, 12.4–1
Ekman's theory, 12.4–267
Electron collision cross sections, 12.4–349, 12.4–350

Electron density, 12D–117
Electron density measurement, 12.4–129
Electron density of meteor trails, 12.4–112
Electronic computers, 12.4–34
Electronic distance measuring equipment, 12.4–252
Energy conversions, 12.4–226
Engineering metorology, 12.4–88
Entomological problems, 12.4–317
Evaporation suppression, 12.4–44
Evaporation suppression from reservoirs, 12.4–44
"Evgei" winds, 12.4–207
Excessive rainfall, 12.4–238
Exosphere, 12D–30, 12D–36, 12D–50, 12D–74
Explosion waves, 12D–109, 12D–116
Extended forecasting, 12.4–209
Extension to standard atmosphere, 12D–43

F layer tides, 12.4–143
F1 layer ionization, 12.4–108
F2 anomalies, 12.4–142
F2 layer ionization, 12.4–140
Falling sphere method, 12D–12D–157, 12D–169, 12D–177, 12D–187, 12D–189, 12D–194
Falling sphere soundings, 12D–163
Faults, 12.4–167
Firn formation, 12.4–282
Fatso (First Airborne Telescope and Spectrographic Observatory), 12D–7
500 mb prognostic charts, 12.4–209
Flash flood conferences, 12.4–288
Flash floods, 12.4–288
Flood classification, 12.4–289
Flood forecasting, 12.4–289
Floods, 12.4–239
Forecasting circulation types, 12.4–225
Forecasting for shipping, 12.4–66, 12.4–67
Forecasting 300 mb geostrophic winds, 12.4–320
Forest effects on water resources, 12.4–328
Forest-water resources relationships, 12.4–31
Freezing temperature data, 12.4–257
Freezing temperature probabilities, 12.4–257
Frequency data, 12.4–186
Frontogenesis textbooks, 12.4–8
Frost probabilities, 12.4–302
Frost protection methods, 12.4–256
Frost protection of orchards, 12.4–256
Frost statistics charts, 12.4–302
Frost warning services, 12.4–256
Frozen soil, 12.4–261
Frozen soil measurements, 12.4–261
Frozen soil strength, 12.4–261

Galactic radio noise, 12.4–114
General circulation, 12D–53
General circulation theories, 12.4–208
General circulation types, 12.4–6
Geodynamics, 12.4–183
Geoelectrical lightning, 12.4–354
Geomagnetic disturbances, 12.4–154
Geomagnetic field, 12.4–151, 12.4–160
Geomagnetic field anomalies, 12.4–157
Geomagnetic field variations, 12.4–150
Geomagnetic latitude effects on F layer, 12.4–142
Geomagnetic micropulations, 12.4–148, 12.4–152, 12.4–153
Geomagnetic storms, 12.4–156
Geomagnetic theories, 12.4–149
Geophysical conferences, 12.4–36
Geophysical research, 12.4–163
Geophysical stations, 12.4–27
Geostrophic wind analysis, 12.4–227
Geothermal effects, 12.4–185
Geothermal gradient, 12.4–175
Geothermal heat flow, 12.4–176
Glacial dirt cones, 12.4–281
Glacial growth, 12.4–185
Glacial period theories, 12.4–183
Glacial periods, 12.4–311
Glacier investigations, 12.4–249
Glazed frost, 12.4–273
Global radiation data, 12.4–26, 12.4–241
Gradient wind computation, 12.4–188
Gradient winds, 12.4–237
Gravitational time effect, 12.4–60
Gravity survey, 12.4–164
Green flash, 12.4–343
Green sun, 12.4–344
Greenhouse cooling system design, 12.4–91
Gust forecasting, 12.4–48
Gust loads on airplanes, 12.4–49
Gust velocities, 12.4–49
Gustiness, 12.4–49

Hailstone size, 12.4–283, 12.4–284
Hailstorms, 12.4–283
Halo phenomena, 12.4–345
Handbooks, 12D–15, 12D–18
Harmonic analysis of gravity, 12.4–165
Health resorts, 12.4–78
Heat and water balance, 12.4–34
Heat balance of atmosphere, 12D–83
Heat flow through rocks, 12.4–175
Heating degree-day data, 12.4–251
Heating degree days, 12.4–92
Heating of houses, 12.4–92
Heat sources of upper atmosphere, 12.4–102
Heavy nuclei in cosmic radiation, 12.4–122
Height of atmosphere, 12D–54
Heliogeophysics, 12.4–250
High altitude balloons, 12.4–123
High altitude profiles, 12D–135
High altitude radiosonde flights, 12D–150, 12D–173, 12D–178
High frequency wave propagation mechanism, 12.4–335
High level radiosonde data, 12D–190
High level wind data, 12D–190
Historic climates, 12.4–311
History of Antarctic expeditions, 12.4–25
Human bioclimatology, 12.4–74, 12.4–75
Humbolt, A. V., 12.4–41
Humid tropics research, 12.4–313
Humidity diagrams, 12.4–95
Hurricane conferences, 12.4–266
Hydrofronts, 12.4–178
Hydrology, 12.4–30
Hydrology symposia, 12.4–328
Hydromagnetic waves, 12.4–147
Hygroclimatic data handbooks, 12.4–15
Hygroscopic particles, 12.4–189

Ice cap melting, 12.4–166
Ice movement measurement, 12.4–181
Icing, 12.4–273
Industrial meteorologists, 12.4–89
Industrial pollutants, 12.4–93
Information retrieval, 12.4–42
Infrared research, 12.4–242
Insect migration, 12.4–317
Insolation data, 12.4–26
Instability, 12.4–276
Instrumental textbooks, 12D–10
Internal Astronomical Union Meeting, Moscow, Aug. 1958, 12.4–37
ICAO Standard Atmosphere, 12D–42, 12D–43
ICAO Standard Atmosphere tables, 12D–38
International Conference of Inqua, 12.4–32
International Geophysical Year, 1957/1958, 12D–23, 12D–177, 12D–184
IGY advances in aeronomy, 12.4–1
IGY Antarctic program, 12.4–20, 12.4–21
IGY conferences, 12D–193
IGY data analyses, 12.4–5
IGY geomagnetic program, 12.4–154
IGY oceanographic data compilations, 12.4–16
IGY ozone program, 12D–208
IGY radio communication manuals, 12.4–24
IGY research, 12D–194
IGY rocket program, 12D–22. 12D–188, 12D–191
IGY seismology program, 12.4–173
IGY upper atmosphere program, 12D–79
Ion density, 12D–117
Ion distribution around fine charged wires, 12.4–348
Ionization effects on propagation, 12.4–347
Ionization gages, 12D–100
Ionization of gases, 12.4–104
Ionosphere, 12D–20, 12D–64
Ionosphere models, 12D–37, 12D–44, 12D–50
Ionospheric absorption of radio waves, 12.4–137
Ionospheric composition, 12D–117
Ionospheric data, 12D–44
Ionospheric discharges, 12.4–144
Ionospheric drift, 12.4–132
Ionospheric drift measurement techniques, 12.4–133
Ionospheric echoes, 12.4–134
Ionospheric electron density calculations, 12.4–130
Ionospheric electron density measurement techniques, 12.4–130
Ionospheric electron density variation, 12.4–131
Ionospheric ionization, 12.4–55, 12D–68
Ionospheric irregularities, 12.4–127
Ionospheric layer formation, 12.4–141
Ionospheric-magnetic relationships, 12.4–150
Ionospheric observations, 12.4–146
Ionospheric physics, 12D–75
Ionospheric radiation, 12D–113
Ionospheric radio wave propagation, 12.4–129, 12.4–139
Ionospheric radio wave reflection, 12.4–134, 12.4–135
Ionospheric radio wave refraction, 12.4–357
Ionospheric radio wave scattering, 12.4–127
Ionosphereic research, 12D–51, 12D–75
Ionospheric scattering, 12.4–130, 12.4–138
Ionospheric stations, 12.4–23
Ionospheric tides, 12D–125
Ionospheric winds, 12D–51, 12D–124
Isostatic compensation, 12.4–167
Isotropic turbulence, 12.4–232

Jaggar, Thomas Agustus, 12.4–169
Jet flight planning, 12.4–47
Jet stream flying, 12.4–50
Jet stream studies, 12.4–237, 12D–79
Jet stream textbooks, 12.4–5, 12.4–6

Kleinschmidt, E., 12.4–40

Lambert's law, 12.4–182
Lapse note variations, 12D–70
Large scale exchange, 12D–61
Legal aspects of outer space, 12.4–64
Leonid stream, 12.4–110
Light of the night sky, 12D–64
Light intensity scattering, 12.4–216
Lightning hazard, 11.4–354
Lightning properties, 12.4–353
Lime coat effects on tree trunk temperatures, 12.4–69
LOKI rockets, 12D–203
Long range forecasting 12.4–206
Long range forecasting for European U.S.S.R., 12.4–12
Lumber drying, 12.4–95
Lunar atmosphere, 12.4–104
Lunar diurnal variations, 12D–125
Lunar eclipses, 12D–98
Lunar seismicity, 12.4–103
Lysimetry symposia, 12.4–328

Machine methods of aerological computation, 12D–17
Magnetic field effects on ionospheric density, 12.4–131
Magnetic storms, 12.4–147, 12.4–155, 12D–28
Magnetohydrodynamics, 12.4–347
Magnetometers, 12.4–155
Marine climate effects on tuberculosis patients, 12.4–325
Marine meteorological observations, 12.4–68
Markov theory, 12.4–165
Mass spectrometer analysis, 12.4–55
Materials testing, 12.4–97
Mathematical techniques, 12.4–234
Maximum snow load maps, 12.4–94
Maximum wind force maps, 12.4–94
Mean free path of N_2, 12D–46
Mean Northern Hemisphere charts (500-15 mb), 12.4–5
Mean 20 mb charts, 12D–190
Mechanics of the atmosphere, 12D–69
Meriodional circulation theories 12.4–224
Mesonalysis, 12.4–280
Mesosphere, 12D–160, 12D–179, 12D–203, 12D–205
Mesospheric temperatures, 12D–206
Mesospheric winds, 12D–206
Meteor ablation theory, 12D–152
Meteor orbits, 12.4–109
Meteor photography, 12D–105
Meteor research 12D–124
Meteor showers, 12.4–110
Meteor trails, 12.4–112, 12D–105
Meteorological conferences, 12.4–34

Meterological disasters, 12.4–294
Meteorological effects on runoff, 12.4–285
Meteorological literatureresearching, 12.4–42
Meteorological satellite networks, 12.4–58
Meteorological seminars, 12.4–35
Meteorological services, 12.4–67
Meteorological symposia, 12.4–30
Meteorological textbooks, 12.4–10
Meteorological workbooks, 12.4–10
Meteors, 12D–84
Mie scattering theory, 12.4–242
Microbarographs, 12D–109
Micrometeorological wind profiles, 12.4–264
Minitrack system, 12.4–65
Mirage observations, 12.4–339
Mirages, 12.4–340
Model atmospheres, 12D–33
Moisture content of materials, 12.4–96
Moisture measurement instruments, 12.4–96
Molecular density measurements, 12D–106
Monsoon effects on rainfall, 12.4–279
Monsoon fluctuations, 12.4–235
Moon, 12.4–103
Moon's surface, 12.4–105
Moonwatch program, 12.4–65
Mortality due to weather, 12.4–71
Mountain observation techniques, 12.4–191
Mountain resort sites, 12.4–76
Mugogo Volcano, 12.4–168

NACA standard atmosphere, 12D–47, 12D–52, 12D–164
National Center for Polar Research, Belgium, 12.4–25
Natural earth satellites, 12.4–109
Natural radioactivity in the atmosphere, 12.4–220
Natural synoptic regions, 12.4–212
Natural synoptic seasons, 12.4–210
Névé research, 12.4–184
Nike-Deacon rocket soundings, 12D–163
Nitrogen in sea surface water, 12.4–180
Normal precipitation data for Israel, 12.4–299
Northern Hemisphere air masses, 12.4–312
Northwestern United States-Alaska air route, 12.4–49
Nuclear explosion effects on weather, 12.4–80
Nuclear reactions on the sun, 12.4–244
Numerical forecasting textbooks, 12.4–8

Obituary of T. A. Jaggar, 12.4–169
Obituary of Ernst Kleinschmidt, 12.4–40
Objective forecasting methods, 12.4–275
Ocean circulation variations, 12.4–310
Ocean temperature influences, 12.4–12
Ocean temperatures, 12.4–179
Oceanographic atlas for Atlantic, 12.4–16
Oceanographic surveys, 12.4–22
Operation Deep Freeze, 1956–1957, 12.4–22
Optical soundings, 12D–98
Optimum flight planning, 12.4–50
Orographic effects on atmospheric circulation, 12.4–236
Orographic effects on jet stream, 12.4–5
Orographic effects on sea level pressure, 12.4–323
Orographic effects on winds, 12.4–264
Orthokinetic coagulation of cloud droplets, 12.4–268
Outer space law, 12.4–64
Ozone absorption, 12D–130
Ozone data, 1.4–215, 12D–87
Ozone distribution, 12D–137
Ozone layers, 12D–107, 12D–143, 12D–208
Ozone measurement techniques, 12.4–215
Ozone Near the ground, 12D–208
Ozone spectroscopy, 12D–131
Ozone osphere heating, 12D–107, 12D–199
Ozoneosphere temperature measurement techniques, 12D–131
Ozoneosphere temperatures, 12D–154, 12D–155

Paleontological correlations, 12.4–310
Perturbation equations, 12.4–236
Photoelectric photometers, 12.4–197, 12.4–198
Photometry of cosmic rays, 12.4–122
Photometry of rocks, 12.4–105
Photometry of solar corona, 12.4–245
Physical constants, 12D–47
Physics of fluids, 12.4–232, 12.4–347
Physics of the atmosphere, 12.4–33
Physics of the ionosphere, 12.4–128, 12.4–140
Physics of the solid earth, 12.4–163
Pilaeus clouds, 12.4–276
Pion distribution, 12.4–352
Plane wave propagation, 12.4–128
Planetary boundary layer, 12.4–263
Planets, 12.4–159
Plant geography of Central America, 12.4–293
Pleistocene ocean temperatures, 12.4–310
Polar displacement, 12.4–166
Polar fronts, 12.4–332
Popular science books, 12D–9
Population growth cycles, 12.4–333
Positive ions in ionosphere, 12.4–55
Potential gradient variations, 12.4–205
Potentiometer system, 12.4–200
Precipitation correlation, 12.4–301
Precipitation effects on radar echoes, 12.4–192
Precipitation effects on radioactivity, 12.4–85
Precipitation estimation, 12.4–187
Precipitation—Evaporation (P—E), 12.4–296
Precipitation formation, 12.4–228
Precipitation measurement techniques, 12.4–191
Pressure calculations, 12.4–323
Pressure data discrepancies between American and Russian observations, 12D–181
Pressure field analysis, 12.4–234
Pressure fields, 12.4–188, 12.4–237

Pressure gradient, 12D–112
Pressure height calculations, 12.4–190
Pressure measurements in stratosphere, 12D–27
Pressure variations, 12D–32
Primary cosmic ray intensities, 12.4–122
Prognostic charts, 12.4–209
Progress in climatology, 12.4–39
Propagation of light, 12.4–13
Punched cards, 12.4–42

Quantum mechanics, 12.4–351

Radar aids to navigation, 12.4–38
Radar echoes from auroras, 12.4–356
Radar meteor observation, 12D–152
Radar performance, 12.4–192
Radar-synoptic analysis, 12.4–280
Radar weather forecasting, 12.4–38
Radiation balance, 12D–103
Radiation measurement devices, 12.4–195
Radiation measurement equipment, 12.4–26
Radio astronomy, 12.4–159
Radio astronomy of sun, 12.4–117
Radio communication, 12.4–24
Radio echo meteor soundings, 12D–138
Radio echoes, 12D–132
Radio emission from sun, 12.4–115
Radio interference, 12.4–114
Radio noise, 12D–113
Radio star scintillation, 12.4–116
Radio star scintillation, 12.4–116
Radio wave propagation, 12.4–18, 12.4–171
Radio wave scattering, 12.4–138
Radioactive clouds, 12.4–84
Radioactive fallout bibliographies, 12.4–86
Radioactive fallout computation, 12.4–85
Radioactive fallout hazards, 12.4–81
Radioactive isotopes, 12.4–82
Radioactive pollution, 12.4–83
Radioactive pollution of atmosphere, 12.4–87
Radioactive tracers, 12.4–233
Radioactivity due to solar neutrons, 12.4–244
Radioactivity-weather relationships, 12.4–220
Radiometers, 12.4–195, 12.4–196
Radiosonde data, 12D–25, 12D–111
Radiosonde development, 12D–195
Radiosonde textbooks, 12D–10
Radiosondes, 12D–17
Ragweed pollen count variations, 12.4–77
Rain gage data analysis, 12.4–187
Rain gages, 12.4–191
Rainfall distribution, 12.4–279
Rainfall intensities, 12.4–239, 12.4–280
Random walk, 12.4–166
Record high temperatures, 12.4–254
Record low temperatures, 12.4–252 to 12.4–255
Recreational climatology, 1.4–79
Re-entry of tektites, 12.4–111
Refractive index tables, 12.4–136
Regional climatology of U.S.S.R., 12.4–9
Relative humidity charts, 12.4–95
Review articles, 12D–65, 12D–118, 12D–124
Rocket antennas, 12.4–61
Rocket bibliography, 12D–21
Rocket communication systems, 12D–171
Rocket data, 12D–23, 12D–34, 12D–48, 12D–102, 12D–120, 12D–130, 12D–157, 12D–209
Rocket data comparisons, 12D–181
Rocket development, 12D–93
Rocket exploration of the upper atmosphere, 12D–6, 12D–8, 12D–21, 12D–35, 12D–76, 12D–188, 12D–207
Rocket flights, 12D–22
Rocket-grenade data, 12D–170
Rocket-grenade experiments, 12D–159, 12D–184, 12D–200, 12D–206
Rocket-grenade temperature determination, 12D–156, 12D–180, 12D–204
Rocket-grenade wind determination, 12D–156, 12D–180, 12D–204
Rocket instrumentation, 12.4–144, 12D–7, 12D–24, 12D–101, 12D–156
Rocket investigations, 12.4–60
Rocket measurement of cosmic rays, 12.4–57
Rocket measurements, 12D–27, 12D–31, 12D–60, 12D–165, 12D–171
Rocket observation data, 12D–82
Rocket observation techniques, 12D–142, 12D–144, 12D–162, 12D–172, 12D–191
Rocket observations, 12D–59, 12D–145, 12D–183, 12D–205
Rocket pressure instruments, 12D–175
Rocket radiation data, 12.4–56
Rocket research, 12D–11, 12D–14, 12D–26, 12D–62, 12D–117
Rocket soundings, 12D–7, 12D–67, 12D–76, 12D–101, 12D–137, 12D–140, 12D–182, 12D–189, 12D–194, 12D–203
Rocket spectrograph observations, 12D–68
Rocket uses in geodesy, 12.4–59
Rockets, 12D–26, 12D–126, 12D–132
Runoff regime, 12.4–285
Runway light range, 12.4–337
Russian textbooks, 12D–9

Satellite data, 12D–23, 12D–34
Satellite density measurements, 12D–40, 12D–66
Satellite ionospheric observations, 12.4–55, 12.4–139
Satellite observational data, 12D–35
Satellite observations, 12.4–2, 12D–41
Satellite observatories, 12.4–2, 12D–7, 12D–8
Satellite optical observation techniques, 12.4–62
Satellite orbits, 12.4–65, 12.4–109
Satellite research, 12.4–159
Satellite tracking program, 12.4–65
Satellite uses, 12D–210
Satellites, 12.4–58
Scattering function, 12.4–342
Scattering index measurements, 12.4–216
Scattering of light, 12.4–13
Scavenging by cloud elements, 12.4–84
Sea breeze effects, 12.4–263
Sea salt hygroscopic particles, 12.4–189
Sea surface layer-snow relationships, 12.4–180

Sea temperature-salinity profiles, 12.4–16
Searchlight soundings, 12D–128
Searchlight techniques, 12D–106, 12D–108, 12D–114, 12D–134, 12D–135, 12D–161, 12D–166
Searchlights, 12D–161
Seaside resorts, 12.4–70, 12.4–73
Seasonal atmospheric circulation, 12.4–210
Seasonal forecasting manuals, 12.4–14
Seasonal trends, 12D–134
Sedimentation of erythrocytes, 12.4–74, 12.4–75
Seismic soundings on moon, 12.4–103
Seismographic phenomena, 12.4–170
Seismology, 12.4–172, 12.4–173
Selenium cell microphotometers, 12.4–198
Selenium photoelement, 12.4–197
Semidiurnal pressure variations, 12D–49
Severe winters, 12.4–92
Sferics, 12.4–193
Shelter belt influences, 12.4–326
Ship effects, 12.4–192
Short wave radio transmission, 12.4–357
Silver iodide tracers, 12.4–233
6300 Å red oxygen line, 12.4–358
Skin diseases, 12.4–72
Sky phenomena, 12.4–341
Skyhook balloons, 12D–7
Snow-air temperature relationships, 12.4–258
Snow cover, 12.4–287
Snow cover effects on soil temperature, 12.4–258
Snow house microclimates, 12.4–17
Soil classification, 12.4–19
Soil climates, 12.4–314
Soil formation, 12.4–19
Soil freezing, 12.4–260
Soil heat flux, 12.4–259
Soil moisture determination, 12.4–290
Soil moisture instruments, 12.4–203
Soil moisture measurement techniques, 12.4–203
Soil organic matter formation, 12.4–319
Soil permeability, 12.4–327
Soil temperature data, 12.4–259
Soil temperature under snow, 12.4–258
Soil temperature-soil type relationships, 12.4–260
Soil thawing, 12.4–260
Solar activity, 12D–149
Solar atmosphere, 12D–37
Solar corpuscular clouds, 12.4–117
Solar corpuscular currents, 12.4–248
Solar corpuscular radiation, 12.4–102
Solar corpuscular velocities, 12.4–247
Solar corpuscules, 12.4–247
Solar cosmic rays, 12.4–124, 12.4–125
Solar cycle, 12.4–121
Solar cycle variations of F2 ionization, 12.4–140
Solar eclipse, June 30, 1954, 12.4–336
Solar eclipse effects on F1 layer, 12.4–108
Solar eclipse effects on geoelectric field, 12.4–107
Solar eclipse effects on weather, 12.4–336
Solar eclipse observation, 12.4–106
Solar effects on radio wave propagation, 12.4–113
Solar energy distribution, 12.4–243
Solar energy spectrum, 12.4–243
Solar flare effects on cosmic rays, 12.4–100, 12.4–123
Solar flares, 12.4–101, 12.4–117, 12.4–125
Solar influences, 12D–122
Solar magnetic fields, 12.4–246
Solar neutrons, 12.4–244
Solar physics conferences, 12.4–52
Solar prominences, 12.4–99
Solar radiation-illumination relationships, 12.4–91
Solar radiation measuring equipment, 12.4–197, 12.4–198
Solar radiation effects on population growth, 12.4–333
Solar radio brightness, 12.4–118
Solar radio frequency radiation studies, 12.4–246
Solar radio radiation, 12.4–113
Solar-terrestrial relationships, 12.4–101
Solar wind, 12.4–159
Solid nuclei sublimation, 12.4–270
Sound propagation, 12D–89
Sound waves, 12D–99
Sound velocity, 12D–88
South Pacific air routes, 12.4–213
Soviet Antarctic expecitions, 12.4–28
Soviet Antarctic research, 12.4–27
Soviet astronautics, 12.4–54
Soviet participation in IGY, 12D–193
Soviet space probe 1959 (Lunik II), 12.4–57
Space exploration conferences, 12.4–52
Space law, 12.4–64
Space research, 12.4–53
Spectrograph measurements, 12.4–144
Spread F, 12.4–116, 12.4–139
Squall lines, 12.4–265
Standard atmosphere, 12D–32, 12D–39, 12D–40, 12D–45, 12D–47, 12D–70, 12D–100
Standard atmosphere tables, 12D–56
Standard atmosphere to 220 km, 12D–46
Statistical analysis of gravity, 12.4–165
Statistical methods in climatology, European U.S.S.R., 12.4–11
Stellar atmospheres, 12D–61
Storm phenomena, 12.4–140
Stratified climatology, 12.4–320
Stratosphere, 12D–20, 12D–99, 12D–160, 12D–167
Stratospheric circulation, 12D–53
Stratospheric density, 12D–87, 12D–106, 12D–108, 12D–134
Stratospheric humidity instruments, 12.4–201
Stratospheric monsoons, 12.4–235
Stratospheric motions, 12.4–226
Stratospheric pressure, 12D–134, 12D–197
Stratospheric research, 12D–168
Stratospheric scattering, 12D–108
Stratospheric structure, 12D–67, 12D–90, 12D–93, 12D–94, 12D–103, 12D–111, 12D–124, 12D–168

Stratospheric temperature maximum, 12D–129
Stratospheric temperature variations, 12D–166
Stratospheric temperatures, 12D–53, 12D–84, 12D–123, 12D–128, 12D–130, 12D–133, 12D–134, 12D–168, 12D–190, 12D–197
Stratospheric warming, 12D–74
Stratospheric winds, 12D–81, 12D–133, 12D–168, 12D–190, 12D–197
Stronium^{90} fallout, 12.4–82
Stronium^{90} in plants, 12.4–82
Stronium^{90} removal by runoff, 12.4–286
Structural geology, 12.4–164
Structure of earth's cryst, 12.4–36
Sublimation nuclei, 12.4–270
Subsurface temperature measurements, 12.4–260
Sudden commencements, 12.4–147, 12.4–153, 12.4–156
Sunshine in the stratosphere, 12D–73
Sunspot radio radiation, 12.4–115
Sunspot-scintillation relationships, 12.4–116
Sunspots and magnetic storms, 12.4–115
Super gradient winds, 12.4–237
Superior mirages, 12.4–339
Surface temperature effects on jet take-off, 12.4–47
Synoptic analysis of cloud patterns, 12.4–274
Synoptic conditions over Europe, 12.4–211
Synoptic data, 12D–203
Synoptic meteorology, 12.4–30
Synoptic types over Eurasia, 12.4–14
Synoptic weather types, 12.4–301

Terrestrial gravimetry, 12.4–165
Taylor micromanipulator, 12.4–214
Taktite origin, 12.4–111
Telephonic weather forecasts, 12.4–66
Temperature data, 12.4–190
Temperature effects on strength of wood, 12.4–97
Temperature extremes, 12.4–254
Temperature gradient, 12.4–211, 12D–61
Temperature inversions, 12.4–263
Temperature measurement techniques, 12D–142
Temperature of the ionosphere, 12D–113
Temperature profiles, 12D–49, 12D–100, 12D–126
Temperature regime, 12.4–250
Temperature variations, 12D–207
Temperature variations on ice cap, 12.4–249
Textbooks, 12D–12, 12D–16, 12D–19, 12D–20
Thermal conductivity of snow, 12.4–258
Thermal convection, 12D–61
Thermocline-thermohaline circulation, 12.4–179
Thermodynamic wet bulb temperature, 12.4–202
Thermodynamics of atmosphere, 12.4–228
Thermodynamics of dew formation, 12.4–271
Thermosphere, 12.4–221, 12D–179
Thundercloud discharges, 12.4–353
Thunderstorms, 12.4–284
Tidal theory of the *Sq* magnetic field, 12.4–149
Tiros cloud photographs, 12.4–274
Topographic effects on zonal current, 12.4–324
Tornado damage patterns, 12.4–240
Transponders, 12.4–63
Transportation industry, 12.4–90
Transosonde flight data, 12.4–194
Tree ring growth, 12.4–304
Tree ring studies, 12.4–309
Tree trunk temperatures, 12.4–69
Tropical cyclones, 12.4–238, 12.4–266
Tropopause height variations, 12.4–219
Tropopause ozone, 12D–87
Tropopause theories, 12D–83
Tropospheric radio wave propagation bibliographies, 12.4–45
Turbidity meters, 12.4–197, 12.4–198
Turbulence effects on airplanes, 12.4–48
Turbulence effects on ionospheric density, 12.4–131
Twilight discontinuities, 12D–129
Twilight phenomena, 12D–158
Twilight phenomena, 12D–158
Twilight sky brightness, 12D–115
Twilight spectra, 12D–71

UHF radio wave propagation, 12.4–45
Ultraviolet radiation, 12D–107
U. S. satellite, 1958 Alpha (Explorer I), 12D–34
U. S. satellite, 1958 Beta (Vanguard I), 12D–34
U. S. satellite, 1960 Beta (Tiros I), 12.4–58, 12.4–274
U. S. satellite tracking program, 12.4–65
Upper air circulation, 12.4–235, 12D–153
Upper air climatology, 12.4–300
Upper air climatology charts, 12.4–321
Upper air data, 12D–5, 12D–11, 12D–25, 12D–52, 12D–82
Upper air data—100 km (15 mb), 12.4–5
Upper air observation, 12D–10
Upper air observation techniques, 12D–17, 12D–164
Upper air observations during eclipse, 12.4–106
Upper air pressure, 12D–77, 12D–78, 12D–138, 12D–165
Upper air pressure measurements, 12D–179
Upper air soundings, 12D–180
Upper air studies, 12D–164
Upper air temperature anomalies, 12D–149
Upper air temperature calculations, 12D–92, 12D–196
Upper air temperature data, 12D–27, 12D–146, 12D–159, 12D–173, 12D–184, 12D–200, 12D–205
Upper air temperature effects on tropopause height, 12.4–219
Upper air temperature measurement, 12D–121, 12D–145
Upper air temperature measurement techniques, 12D–91' 12D–139, 12D–141, 12D–192, 12D–209
Upper air temperature-ozone relationships, 12D–208
Upper air temperature variations, 12D–137

Upper air temperatures, 12D–15, 12D–29, 12D–43, 12D–58, 12D–77, 12D–78, 12D–84 to 12D–86, 12D–88, 12D–89, 12D–95, 12D–97, 12D–102 to 12D–104, 12D–110, 12D–118 to 12D–122, 12D–127, 12D–143, 12D–147, 12D–150, 12D–151, 12D–157, 12D–158, 12D–164, 12D–176, 12D–178
Upper air wind data, 12D–146, 12D–173, 12D–184, 12D–200
Upper air wind measurement techniques, 12D–139, 12D–209
Upper air wind measurements, 12D–145
Upper air winds, 12.4–235, 12D–20, 12D–29, 12D–53, 12D–95, 12D–96, 12D–119, 12D–127, 12D–138, 12D–143, 12D–147, 12D–150, 12D–151, 12D–153, 12D–176, 12D–178
Upper atmosphere, 12D–31, 12D–49, 12D–55, 12D–98, 12D–100, 12D–112, 12D–118, 12D–135, 12D–163
Upper atmosphere composition, 12D–52, 12D–77
Upper atmosphere densities, 12D–15, 12D–16, 12D–40, 12D–58, 12D–66, 12D–105, 12D–157, 12D–165, 12D–201
Upper atmosphere densities from meteors, 12D–152
Upper atmosphere density data, 12D–185
Upper atmosphere density measurement, 12D–136, 12D–141, 12D–161, 12D–169
Upper atmosphere density variations, 12D–177
Upper atmosphere diffusion, 12.4–145
Upper atmosphere instruments, 12D–17, 12D–195
Upper atmosphere measurements, 12D–186
Upper atmosphere models, 12D–48, 12D–201
Upper atmosphere observation techniques, 12D–194
Upper atmosphere observations, 12D–23
Upper atmosphere parameters, 12D–33
Upper atmosphere phenomena, 12D–9
Upper atmosphere physics, 12.4–1, 12D–1, 12D–3, 12D–4, 12D–11 to 12D–13, 12D–50, 12D–68, 12D–74
Upper atmosphere pressure measurement, 12D–175
Upper atmosphere properties, 12D–42
Upper atmosphere research, 12D–7, 12D–19, 12D–26, 12D–28, 12D–54, 12D–60, 12D–65, 12D–79, 12D–81, 12D–101, 12D–132, 12D–138, 12D–144, 12D–162, 12D–170, 12D–174, 12D–189, 12D–191, 12D–204
Upper atmosphere sounding methods, 12D–188
Upper atmosphere structure, 12D–2, 12D–5, 12D–14' 12D–48, 12D–76, 12D–183
Upper atmosphere temperature density, 12D–163
Upper atmosphere temperatures, 12D–16, 12D–96
Upper atmosphere textbooks, 12D–1, 12D–3, 12D–4, 12D–6
Upper stratosphere, 12D–30, 12D–95, 12D–182

V-2 rocket flights, 12D–100
Van Allen belts, 12.4–57, 12.4–157–12.4–160, 12.4–359
Vapor pressure gradient over vegetation, 12.4–272
Vapor trap, 12.4–201
Vector winds, 12.4–321
Vertical displacement of earth's crust, 12.4–167
Vertical ozone distribution, 12D–208
Vertical temperature distribution, 12D–54, 12D–69
Vertical temperature gradient, 12D–70, 12D–71, 12D–112, 12D–210
Vertical temperature variations, 12D–32, 12D–182
VHF radio wave propagation, 12.4–45
Visibility measurements, 12.4–217
Visibility variations, 12.4–338
Visual acuity, 12.4–337
Volcanic activity, 12.4–170
Volcanic eruptions, 12.4–168
Volcanic influences, 12.4–171
Volcanology, 12.4–169
Vortex movement, 12.4–223
Vorticity equations, 12.4–208, 12.4–223

Washing of nuclei by precipitation, 12.4–269
Water budget, 12.4–287
Water regime of soils, 12.4–327
Water resources in arid regions, 12.4–316
Water vapor, 12.4–350
Water vapor transport, 12.4–222
Weather data comparisons, 12.4–294
Weather effects on atmospheric pollution, 12.4–218
Weather effects on birthrates, 12.4–318
Weather effects on crop yields, 12.4–315
Weather effects on humus conservation in tropical climates, 12.4–319
Weather effects on ragweed pollen, 12.4–77
Weather effects on transportation equipment production, 12.4–90
Weather ships, 12.4–68
Weather stations, Antarctica, 12.4–25
Weather type classification, 12.4 329
Westerly circulation, 12.4–236
Wet bulb temperature ranges, 12.4–186
White Sands Aerological Unit, 12D–7
Wind and snow loads on buildings, 12.4–94
Wind direction recorders, 12.4–200
Wind driven currents, 12.4–267
Wind field above the ocean, 12.4–303
Wind field charts, 12.4–303
Wind field theories, 12.4–237
Wind forecasting errors, 12.4–213
Wind machines, 12.4–256
Wind shear, 12.4–321
Wind speed near the ground, 12.4–264
Wind variations on ice cap, 12.4–249
Winter temperature, 12.4–301
Wolf number, 12.4–250
WMO progress report, 12.4–39

Zodiacal light, 12.4–161, 12.4–162
Zonal current perturbations, 12.4–324
Zonal winds, 12.4–229
Zoological bioclimatology, 12.4–333

INDEX OF GEOGRAPHICAL LOCATIONS

NORTHERN HEMISPHERE, 12.4–210, 12.4–212, 12.4–222, 12D–153
EQUATORIAL REGIONS, 12.4–156
AFRICA
Equatorial Africa, 12.4–265

Angola, 12.4–292
Congo, Republic of the [formerly Belgian Congo]
Kivu, 12.4–168
Léopoldville-Binza, 12.4–143, 12.4–265
Eritrea, 12.4–46
Ethopia, 12.4–46, 12.4–298
Kenya,
Nairobi, 12.4–30
Malagasy Republic [formerly Madagascar], 12.4–238, 12.4–239
Nigeria
Ibadan, 12.4–150
Somali Republic [formerly Somaliland], 12.4–46
ASIA
Central Asia, 12.4–33
South Asia, 12.4–317

China
Tibetan Plateau, 12.4–236
India, 12.4–173, 12.4–279, 12D–99, 12D–111
Israel, 12.4–299
Japan, 12.4–106, 12.4–251, 12.4–294, 12.4–297, 12.4–309, 12.4–330, 12D–25
Kanto District, 12.4–280
Pakistan, 12.4–279
U.S.S.R. (in Asia), *see also* **U.S.S.R.** *under* Europe
Kazakhstan
Ala Kul, 12.4–207
Siberia (Asiatic S.F.S.R.)
Altai Region, 12.4–295
Tomsk Region, 12.4–295
Turkmenia
Ashkhabad, 12.4–133
AUSTRALASIA
Australia
Northern Territory
Alice Springs, 12D–158
South Australia
Woomera, 12D–200
Victoria
Melbourne, 12.4–97
Swan Hill, 12.4–276
New Zealand, 12.4–180
Mt. Ruapehu, 12.4–281
EUROPE, 12.4–211
Central Europe, 12.4–289

Alps, 12.4–325, 12.4–340, 12D–131
Austria
Vienna, 12.4–92, 12.4–204, 12.4–215
British Isles
Great Britian
Ehgland, 12D–151
Cambridge, 12.4–176
London Airport, 12.4–338
Southeast England, 12.4–201
Scotland
Inverness-shire, 12.4–187
Skye (Inner Hebrides), 12.4–344
Ireland
Valentia, 12.4–85
Bulgaria
Sofia, 12.4–227
Czechoslovakia, 12.4–333
Hradec Králove, 12.4–241
Luhačovice, 12.4–278
Milešovka (formerly Donnersberg), 12.4–339
Germany, 12.4–66, 12.4–80, 12.4–345
Berlin, 12D–123
East Germany, 12.4–71, 12.4–79, 12.4–88
Fichtelberg Mt., 12.4–76
Helgoland, 12D–92, 12D–116
Lindenberg, 12D–87
Nordeney, 12.4–70
Oldebroek, 12D–143
Schleswig-Holstein, 12.4–315
Trassenheide/Usedom, 12.4–73
Walchen Lake, 12.4–287
Greece
Rhodes, 12.4–343
Hungary, 12.4–175
Budapest, 12.4–211, 12.4–217, 12.4–277
Carpathian Basin, 12.4–211
Italy
Italian Alps, 12.4–167, 12.4–329
Stromboli, 12.4–151
Netherlands
Limbourg, 12.4–285
North Sea, 12.4–325
Norway
Harestua, 12.4–246
Poland, 12.4–51
Portugal, 12.4–301
Rhine Valley, 12.4–167
Scandinavia, 12.4–336
Spain, 12.4–301
Sweden, 12.4–296
Switzerland, 12.4–182
U.S.S.R. (European and General), 12.4–5, 12.4–6, 12.4–7, 12.4–9, 12.4–10, 12.4–14, 12.4–250, 12.4–290, 12.4–295, 12.4–314, 12.4–332, 12D–174
Black Sea, 12.4–178
European U.S.S.R., 12.4–12, 12.4–219, 12.4–284
Transcaucasus, 12.4–273
Transvolga Region, 12.4–326
Urals, 12.4–248
S.F.S.R.
Kerch District, 12.4–283
Leningrad, 12.4–35
Moscow, 12.4–120, 12D–193
Rostov-on-Don (Rostov Region), 12.4–38
Ukrane, 12.4–288
Veliko-Anadol'sk Forest, 12.4–327
Yugoslavia, 12.4–190
Bjelasnica, 12.4–191

NORTH AMERICA, 12D–150, 12D–173, 12D–178, 12D–201
Canada
British Columbia
Vancouver Island, 12.4–148
Albert Head, 12.4–152
Manitoba
Fort Churchill, 12D–23, 12D–183, 12D–184, 12D–186, 12D–189, 12D–206, 12D–209
Northwest Territories
Resolute Bay, 12.4–124
Ontario
Ottawa, 12.4–258, 12.4–259
Yukon
Snag, 12.4–255

Caribbean Region
West Indies
La Soufrière (Guadeloupe), 12.4–170
Central America, 12.4–293
Costa Rica, 12.4–291
El Salvador
San Salvador, 12.4–331
Great Lakes, 12.4–67
Greenland, 12.4–184, 12D–150, 12D–173, 12D–178, 12D–190
Thule, 12.4–282
United States, 12.4–94, 12.4–254, 12.4–308, 12.4–321, 12D–190
Rocky Mts., 12.4–236, 12D–147

Alaska, 12.4–304, 12D–127
College, 12.4–100, 12.4–153, 12D–106
California
California costal plain, 12.4–263
China Lake, 12.4–275
Point Mugu, 12D–203, 12D–205
Southern California, 12D–88
Colorado
Wray, 12D–51
Florida, 12.4–256
Idaho, 12.4–98
Arco, 12D–91
Minnesota
International Falls, 12D–185
Nevada, 12D–196
New Jersey, 12.4–260
Belmar, 12D–146
New Mexico, 12D–78, 12D–102, 12D–128, 12D–130, 12D–148
Albuquerque, 12D–134, 12D–135
White Sands, 12D–7, 12D–48, 12D–67, 12D–101, 12D–126, 12D–157, 12D–152, 12D–156, 12D–157, 12D–159
Ohio, 12.4–257
Cincinatti, 12.4–218
Texas, 12.4–122, 11.4–302
Utah, 12.4–164
Odgen Valley, 12.4–164
Virginia, 12.4–15
Wisconsin, 12.4–240

SOUTH AMERICA
Amazon Region, 12.4–313

Argentina, 12.4–322
Chile, 12.4–248
OCEANS, SEAS, AND ISLANDS
Antarctic Regions
Antarctica, 12.4–17, 12.4–20, 12.4–21, 12.4–22, 12.4–27, 12.4–28, 12.4–29, 12.4–33, 12.4–146
Marie Byrd Land, 12.4–185
Roi Baudouin (Queen Maud Land), 12.4–25, 12.4–26
Sovetskaya, 12.4–252, 12.4–253
Falkland Islands Dependencies
South Orkney Islands, 12.4–23
South Shetland Islands, 12.4–23
Arctic Regions
Arctic, 12.4–17, 12.4–18, 12.4–19, 12.4–33, 12D–88, 12D–165, 12D–198
Arctic Ocean, 12.4–310
Norwegian Arctic, 12.4–307
Soviet Arctic
Franz Joseph Land, 12D–182
Atlantic, 12.4–16
North Atlantic, 12.4–310
Iceland, 12.4–249
Pacific, 12.4–50
Johnson Island, 12.4–300
Marshall Islands, 12D–196
South Pacific, 12.4–213

SELECT LIST OF PERIODICALS

Note: This list contains the titles of the periodicals which regularly contain material on meteorology or geophysics and it comprises only a small percentage of the periodicals from which pertinent articles are abstracted. The form of serial entry adopted is given in bold face type below.

Acta Geophysica Polonica, [Warsaw].
Acta Meteorologica Sinica, [Peking].
Akademiia Nauk SSSR, Izvestiia, Ser. Geogr. and **Ser. Geofiz.,** [Moscow].
American Geophysical Union, Transactions, [Washington].
American Meteorological Society, Bulletin, [Boston].
Angewandte Meteorologie, [Potsdam].
Annales de Géophysique, Centre National de la Recherche Scientifique, [Paris].
Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. A and Ser. B, [Vienna].
Australian Journal of Physics, [Melbourne]
Beiträge zur Physik der Atmosphäre, [Frankfurt a. Main].
Ciel et Terre, Société Belge d'Astronomie, Météorologie et Physique du Globe, [Brussels].
Geofisica e Meteorologia, Società Italiana di Geofisica, [Genoa].
Geofisica Pura e Applicata, Istituto Geofisico Italiano, [Milan].
Geophysical Magazine, Japan Meteorological Agency, [Tokyo].
Hemel en Dampkring, [The Hague].
Időjárás, Magyar Meteorológiai Társaság and Országos Meteorológiai Intézet, [Budapest].
Indian Journal of Meteorology and Geophysics, [Delhi].
Journal de Mécanique et de Physique de l'Atmosphère, Société Météorologique de France
Journal of Atmospheric and Terrestrial Physics, [London]
Journal of Geophysical Research, [Washington].
Journal of Meteorological Research, [Tokyo].
Journal of Meteorology, American Meteorological Society, [Boston].
The Marine Observer, Air Ministry, Meteorological Office, London.
The Meteorological Magazine, Air Ministry, Meteorological Office, London.
Meteorologické Zprávy [Prague].
Meteorological Society of Japan, Journal, [Tokyo].
La Météorologie, Société Météorologique de France, [Paris].
Meteorologiia i Gidrologiia, [Leningrad].
Meteorologische Rundschau, [Berlin].
Monthly Weather Review, U. S. Weather Bureau, Washington, D. C.
Polarforschung, Archiv für Polarforschung, [Kiel].
Przegląd Geofizyczny, [Warsaw].
Revista de Geofísica, Instituto Nacional de Geofisica, [Madrid].
Rivista di Meteorologia Aeronautica, Servizio Meteorologico, [Rome].
Royal Meteorological Society, Quarterly Journal, [London].
South Africa, Weather Bureau, Notos, [Pretoria].
Tellus, Svenska Geofysiska Föreningen, Stockholm.
Vsesoiuznoe Geograficheskoe Obshchestvo, SSSR, Izvestiia, [Leningrad].
Weather, Royal Meteorological Society, [London].
Weatherwise, American Meteorological Society, [Boston].
Wetter und Leben, Österreichische Gesellschaft für Meteorologie, [Vienna].
WMO Bulletin, World Meteorological Organization, [Geneva].
Zeitschrift für Meteorologie, Meteorologisches Observatorium, Potsdam.

TABLE OF CONTENTS

Meteorological and Geoastrophysical Abstracts, Volume 12, Number 4, April 1961

Foreword iii

Explanations iv

PART I. ABSTRACTS OF CURRENT METEOROLOGICAL, GEOPHYSICAL AND ASTROPHYSICAL MATERIAL

General 667
Collected Works 667
Textbooks—Technical Books—Handbooks 668
Monographs and Major Review Articles 670
Manuals, Handbooks and Atlases 671
IGY—Arctic—Antarctic 672
Conferences—Symposia 676
Services—Observatories 678
Education—History—Biography—Bibliography 679

Applications 681
Aeronautics 681
Astronautics 682
Shipping 686
Agriculture 687
Medicine 688
Radioactivity 690
Industry 693
Forestry 695

Astronomy and Astrophysics 696
Solar Physics 696
Moon 697
Eclipses 698
Meteors 698
Radio Astronomy 699

Outer Atmosphere 701
Cosmic Radiation 701
Ionosphere 703
Geomagnetism 709
Van Allen Belt 712

Solid Earth Geophysics 714
Geophysics 714
Volcanology 715
Seismology 716
Geothermy 716

Oceanography, Hydrology and Glaciology 717
Oceanography 717
Glaciology 718
Hydrology 720

Meteorological Observations and Instruments 720

Synoptic Analysis and Forecasting 726

Atmospheric Structure and Physics 729
Atmospheric Pollution 729
Radio Meteorology 731
Dynamics of the Atmosphere 732
General Circulation 736
Atmospheric Disturbances 737

Radiation and Temperature 738
Soil Temperature 743

Pressure and Wind 745
Turbulence 745
Upper Air Winds and Vertical Motion 746

Aqueous Vapor, Hydrometeors and Hydrometeorology 747
Humidity, Evaporation, Condensation, Fog and Cloud 747
Precipitation, Rain, Snow and Hail 750
Hydrometeorology 752

Climatology and Bioclimatology 754
Climatic Changes 758
Microclimatology 760
Bioclimatology 763

Miscellaneous 768
Cosmic Influences 768
Optical Phenomena 770
Electrical Phenomena 772
Auroras 774

PART II. ANNOTATED BIBLIOGRAPHY ON UPPER ATMOSPHERE STRUCTURE, p. 776

PART III. RECENT MONOGRAPHS AND CONTENTS OF RECENT SERIALS AND COLLECTED WORKS, p. 828

PART IV. AUTHOR AND SUBJECT INDEXES

Index of Authors 846

Index of Subjects 851

Index of Geographical Locations 860

List of Periodicals ..... Cover 3